BELL TELEPHONE QUARTERLY

VOL. XVIII OCTOBER, 1939 NO. 4

SOME BELL SYSTEM PIONEERING ACHIEVEMENTS

SOME RECENT ADVANCES IN RURAL CONSTRUCTION

PUBLIC TELEPHONES

SAFETY IN THE BELL TELEPHONE COMPANIES

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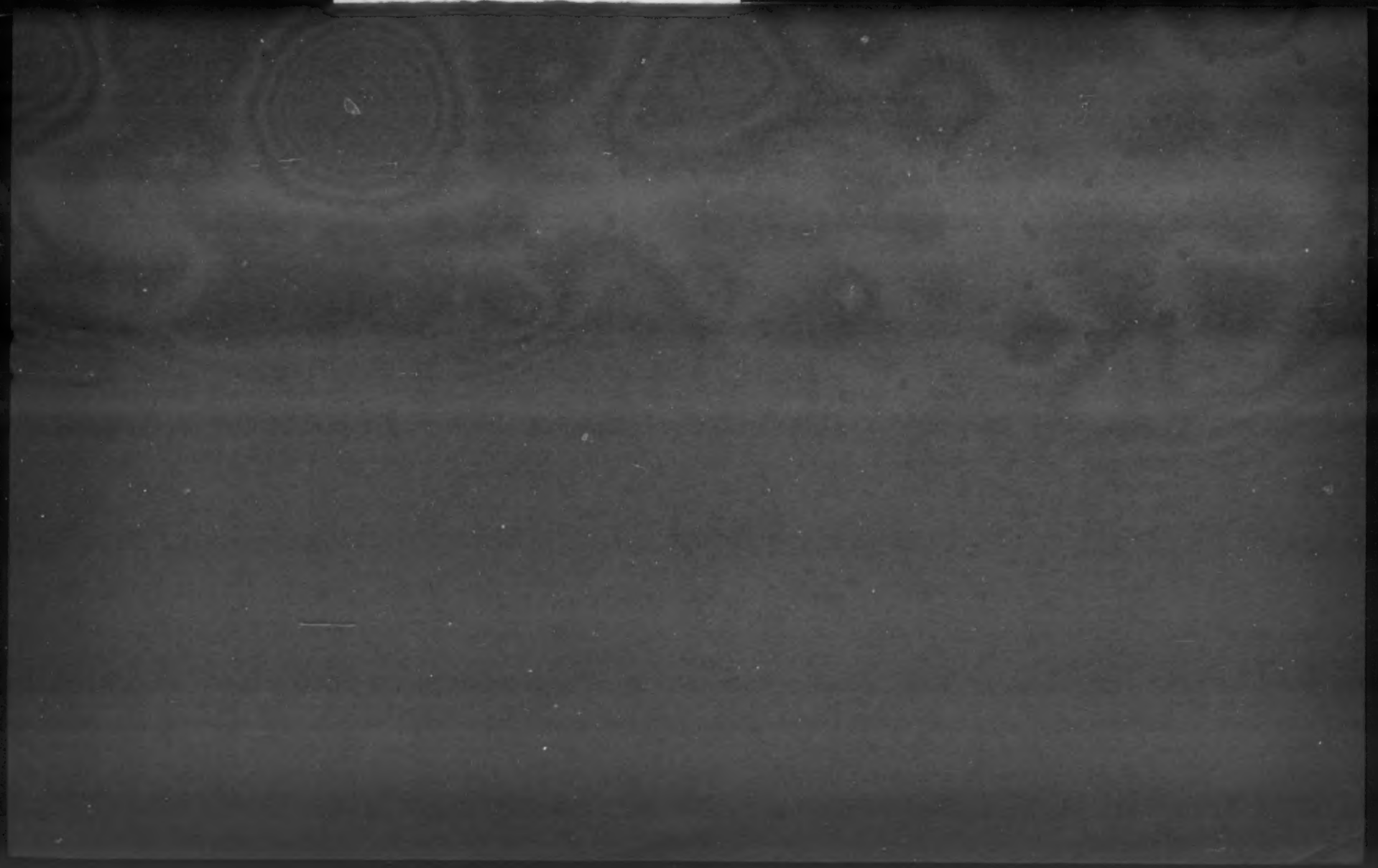

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BELL TELEPHONE QUARTERLY

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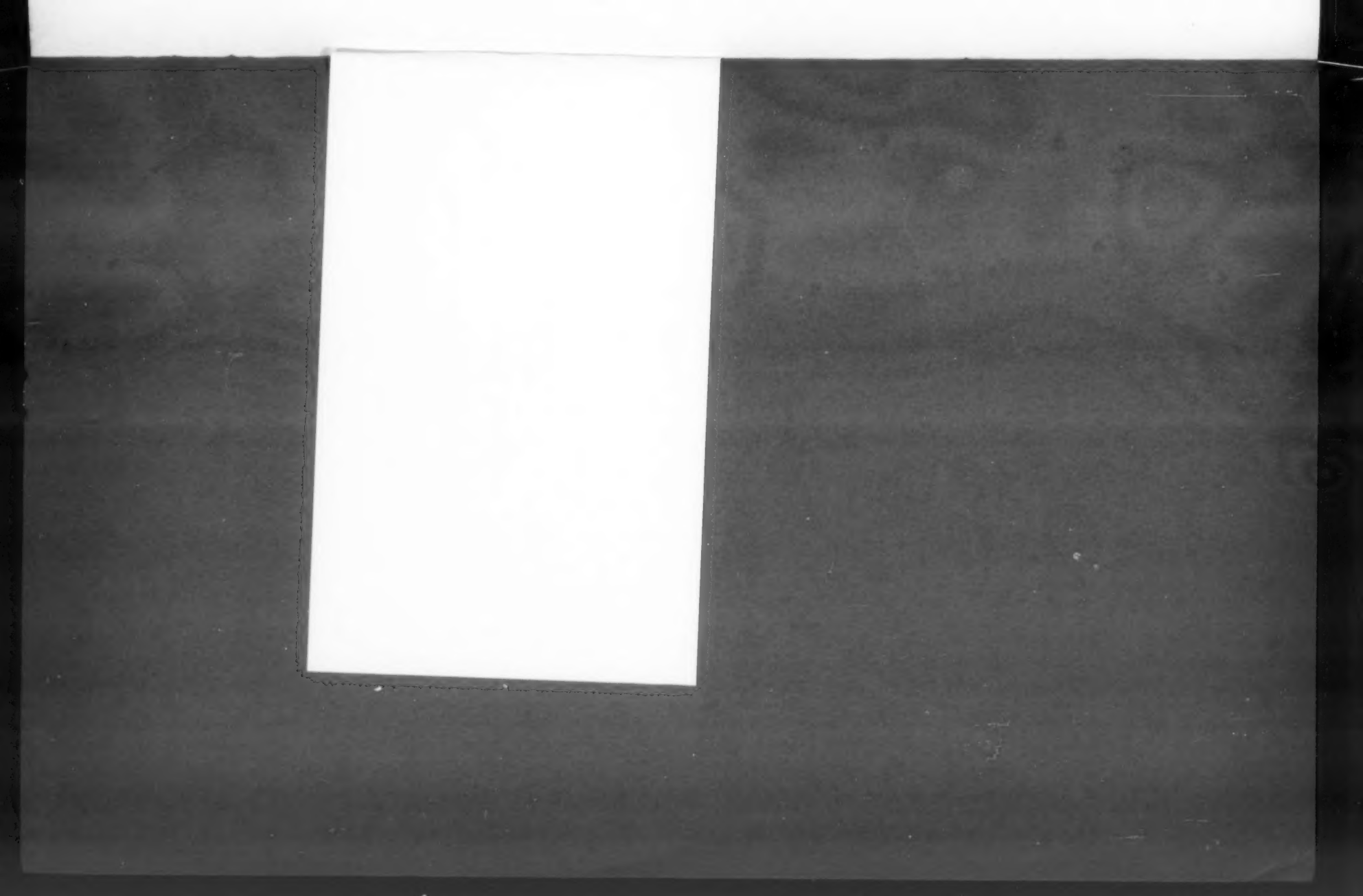

BELL TELEPHONE QUARTERLY

A Medium of Suggestion and a Record of Progress

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Contributors to This Issue

WALTER S. GIFFORD

Harvard University, B.A., 1904. Entered the Bell System as clerk, Western Electric Co., Chicago, 1904; Assistant Secretary and Assistant Treasurer, 1905–08. American Telephone and Telegraph Co., New York, Statistician, 1908–11; Chief Statistician, 1911–16. Government service, as Supervising Director of the National Industrial Preparedness Campaign of the U. S. Naval Consulting Board, Director of the Council of National Defense, and Secretary of the U. S. Delegation of the Inter-Allied Munitions Council in Paris, 1916–18. American Telephone and Telegraph Company, Comptroller, 1918–19; Vice President, 1919–23; Executive Vice President, 1923–25; President, 1925–.

FRANK B. JEWETT

Throop Polytechnic Institute (now California Institute of Technology), B.A., 1898; University of Chicago, Ph.D., 1902. Several honorary degrees. Instructor in Physics and Electrical Engineering, Massachusetts Institute of Technology, 1902–04. American Telephone and Telegraph Company, Transmission and Protection Engineer, 1904–12; Western Electric Company, Assistant Chief Engineer, Chief Engineer, Vice President, 1912–25; Vice President, American Telephone and Telegraph Company, in charge of Development and Research Department, and President, Bell Telephone Laboratories, 1925–.

RAYMOND C. SILVERS

Lehigh University 1908–11. American Telephone and Telegraph Company, Plant Department, Western Union Telegraph Company, Plant Department, Western Electric Company, Material Inspection Division and Engineering Department, 1911–17. American Telephone and Telegraph Company, Long Lines, Engineering Department, 1917–24; Department of Operation and Engineering, 1924–.

PRESCOTT C. MABON

Harvard University, A.B., 1925. Publicity and advertising work, 1925–34. Southern New England Telephone Company, General Information Department, staff, 1934–35, General Information Supervisor, 1935–39. American Telephone and Telegraph Company, Information Department, 1939–.

ERLE S. MINER

University of Kansas, B.S. in E.E., 1922; E.E., 1929. Southwestern Bell Telephone Company, Plant Department, Kansas, 1922–26; Engineer, General Plant Supervisor's Office, St. Louis, Mo., 1926–27; General Installation Supervisor, St. Louis, 1927–28; General Plant Training Supervisor, St. Louis, 1928–29. American Telephone and Telegraph Company, Department of Operation and Engineering, Plant Operation Division, Plant Employment Section, 1929–.

Some Bell System Pioneering Achievements

Two recent events have given occasion for a backward glance over a part of the Bell System's pathway of progress in recent decades and for noting some of the milestones which now lie behind.

One was the General Assembly of the Telephone Pioneers of America, which took place in New York on September 22 and 23. President Walter S. Gifford of the American Telephone and Telegraph Company, who is serving this year as President of the Pioneers, addressed over a wire hook-up the four dinner meetings of the organization held in the city on the evening of the 22d.

The other occasion was the observance on July 28 of the twenty-fifth anniversary of the first telephone conversation between New York and San Francisco over the newly completed transcontinental telephone line. Men who had had a part in the planning and construction of that pioneer achievement were linked by telephone line in seven cities from coast to coast and, as part of the program, heard an address by Dr. Frank B. Jewett, Vice President of the A. T. and T. Company and President of the Bell Telephone Laboratories.

The remarks of these Bell System officials are here brought together because the theme of both addresses is the same: that of specific accomplishments along the System's road toward its ideal of telephone service which shall be of the greatest possible benefit to the entire nation.

I. Mr. Gifford's Address

EACH of us telephone pioneers here has devoted at least twenty-one years to the task of enabling our fellow citizens, however far apart, to talk instantly with each other, any time of day or night, and, in recent years, with practically anyone anywhere in the world. It seems to me, therefore, that on this occasion it is fitting for us to take pride in our achievements and consider our hopes for the future. We know that

individually and collectively we may have made mistakes, but, whatever they have been, the record of achievement speaks for itself and we have every reason to be proud of it.

These are troublous times in the world. There is much to concern us individually about conditions in our own country, and the international situation is fraught with dangerous potentialities for all of us. As citizens, we have grave duties that we share with our fellows outside as well as inside the business, but usually most of us, I have always felt, can make the greatest contribution to the general welfare by doing our own main job well. For us, this main job has been the development and operation of a great system of communications. In its growth and improvement we have pioneered in many matters of social importance besides the technical development of facilities for intercommunication by speech. I do not mean to exclude the latter from the field of matters of social importance, for it is obvious that it is of very great importance to mankind that today there are no earthly limits of distance to practically instantaneous conversation by telephone. The entire development of the telephone is so recent—within the lifetime of many present here tonight—that no one can appraise the real effect upon mankind of this removal of distance as a limitation to human speech.

Advances of Social Significance

Besides this technical development, in which we are recognized as having led the world, there are other achievements in which we have pioneered and which, in my opinion, have been of great importance to the general welfare of our country. By pioneering, I do not mean that we were necessarily the very first to blaze the trail, but I do mean that we were, if not the first, among the first to set out on new paths. On their face, some of these undertakings are not especially interesting, but I

believe they have had very great influence in important ways.

One example of this sort of pioneering is the depreciation accounting of the Bell System. It would be difficult to overestimate the effect of the adoption years ago, shortly after I started in the business, of a fixed depreciation charge to expenses which had to be charged in good times and bad before arriving at net earnings available for dividends. This has been of great importance in the maintenance of the financial integrity of the Bell System and in the rapidity with which new and improved methods have been adopted and obsolete plant has been abandoned. Thus it is interesting to note how what seems to be mere bookkeeping can be of vital consequence not only to investors but to people who use the telephone.

Pioneering in Protection for Employees

We pioneered in the adoption of the Benefit Plan over twenty-six years ago. That was a step far out in front in those days. It provided for definite payments to employees in case of accident or sickness and to dependents of employees in case of death, and for pensions after retirement. Remember that this was over twenty-six years ago, when even accident compensation insurance, now adopted by nearly all the states, was just getting under way. Again, some twelve years ago the Bell System pioneered in the adoption of the accrual plan for providing for pensions, as against the pay-as-you-go plan. The result is that there is now in the hands of trustees, held solely for pension purposes, some $265,000,000. As in depreciation accounting, this pension accrual item of expense must be provided for before arriving at net earnings for dividends. This pension accounting has not been in effect as long as the depreciation accounting, but, in my opinion, in addition to its importance to the welfare of the employee, it ranks with depreciation accounting in its importance to the stockholder and the telephone user.

Centralizing Manufacture, Research, and Development

Practically from the very start of the telephone business, the Bell System has had its own manufacturing department. This was unusual and forward-looking. It has meant that the Bell System has done its own pioneering in the development of physical things, and has manufactured what was wanted instead of relying for progress entirely on such developments as manufacturers, over which it had no control, might produce. Moreover, whatever profits have resulted from the manufacture of equipment have gone to help pay to investors in the business the return necessary to keep the enterprise financially sound. The Bell System's central purchasing and supply department performs a function of great benefit to all. Since its establishment some twenty-five years ago, many other enterprises, including governmental agencies, have set up similar centralized purchasing departments. A word should be said, in passing, of the immense value in time of emergency of this centralization of manufacturing and supply. No better illustration could be had than that of the hurricane disaster of the fall of 1938 in the northeastern section of the United States.

We pioneered again in having research and development carried on in a central organization. This insured progress in spite of the fact that competition in the usual sense of the word —such competition which is assumed to be essential to progress —has been largely absent. In many ways this organization of scientists, engineers, accountants, and experts in management and operating methods has been and remains unique. It has been recognized as a most important factor in the success of the telephone business from the standpoint of those employed in it, those who have invested in it, and the public who use the telephone. Commissioner Eastman of the Interstate Commerce Commission said a few years ago that he would like to see a central scientific, engineering, and economic research

department acting for all the railroads along lines similar to that of the Bell System.

It is not without importance, either, that we were pioneers in that form of advertising which has come to be known as "institutional" advertising, and that this advertising has been uninterrupted since its inception in 1908. In such advertising, it has been natural to emphasize the contributions to the service of the System's men and women, and you are all familiar with the advertisements, "Weavers of Speech," featuring the operator, and "The Spirit of Service," portraying the lineman working in a blizzard.

Also, I believe it is fair to say that we were pioneers in courtesy in business. The "voice with the smile," the "number, please," and the spirit of service that inspires all telephone men and women have been notable characteristics of the telephone business for decades. It is, in fact, important not only to the satisfaction of customers but in its reaction on the employee himself or herself. It would be interesting if one could evaluate the effect of the habit of being courteous under all conditions on the character, self-restraint, and likeableness of the individual and on the satisfaction and pleasure he gets from his job. But it is only men and women of high quality and genuine devotion to the business who can establish and maintain the reputation which I believe the System has for courteous and outstanding service to the public.

Social Responsibilities of Business in a Democracy

One hears a good deal about the recognition on the part of business—big business especially—of its social obligations. Apparently for many this seems a new idea. We know that in our business such recognition of social obligations goes back many years. At a time when other businesses were booming, and stock split-ups and extra dividends were almost the order

of the day, we stated definitely for the Bell System that either earnings in excess of those needed to assure the financial integrity of the business must be spent for the enlargement and improvement of the service or the rates must be reduced. That obligation, which includes fair treatment of employees, has been and will continue to be strictly lived up to. The interrelation of the employee, the stockholder, and the public, and the rights of each, have long been recognized by us, and we are, in my opinion, justified in feeling we were pioneers in recognizing the social responsibilities of business in a democracy.

There are other matters in which we in the telephone business have pioneered and blazed the trail. Time has permitted me to cover only some of them. I realize, in claiming for our industry all that I do, I have in most instances stressed what has been done in the Bell System, which, of course, is by no means the entire industry. I feel, however, that we are all part of the same family; and what one member of the family does, the entire family is concerned with and, if it is creditable, may properly take pride in.

Our Pioneering Still Goes On

For the past ten years we have had a great depression in this country: in extent of unemployment, in the relative decline in business volume, and in duration, the most severe in our history. It is true that public relief has kept millions fed, clothed, and housed, and work has been found or made for millions of those who wanted to work but would otherwise have been unemployed. It is also true that, for the population as a whole, the material standard of living has been higher than that of most of the rest of the world, even in prosperous times. We should not lose sight of these facts; but we must not minimize, either, the severity of the shock which the loss of their jobs and their savings brought to millions of our fellow citizens.

Millions more, even those less directly affected, lost confidence in the future. The country's leaders cannot fail to recognize a challenge in this depression, but neither these leaders nor the country as a whole should interpret it as evidence that the development of the country is finished, that progress is over. To do so would be absurd. We know better; we know that the pioneering in our country and in our particular field of telephone communication is still going on and will go on. I have faith, and I am sure all of you have faith, that, in spite of the troubles which seem to beset us on all sides, the future holds even greater promise than the past.

Those of us in this room represent the 44,459 members of the Telephone Pioneers of America. This number is about twelve per cent of all the employees in the telephone industry, including its manufacturing and research units. Ten years ago, our membership was but 16,700 and that number was only about three per cent of the industry's employees. With this large growth in membership has come a greatly increased opportunity to plan an influential, in fact a decisive, part in the maintenance and enhancement of the industry's ideals of outstanding service to the public. It is our belief and our pride that this reputation for service has become a tradition of the business, recognized by the nation. It is peculiarly the trust given to those who have spent the best part of their lives in the business and who have made it what it is, to preserve and carry forward that tradition.

Let us therefore dedicate ourselves to still greater achievements and let us encourage our younger associates who have not yet been with us long enough to qualify for membership in our great organization of Telephone Pioneers. Let us encourage them to continue to pioneer and to keep up our record of leadership, not only in technical advances, but of leadership in creating and maintaining relationships between management and other employees, stockholders, and the public that benefit

not only the telephone business but the general welfare of our country.

II. Dr. Jewett's Address

MOST of us who are present today had a hand in the creation of the first transcontinental line, and I suspect that most of us were listening in at some vantage point when Mr. Vail spoke the first words over the line from New York to Mr. McFarland in San Francisco twenty-five years ago. That event marked the culmination of an historic engineering effort. It signalized the fact that the transcontinental line was at least a technical success, and I need scarcely recall to your minds how thankful we all were who had been struggling with the problems of transcontinental telephony to see that goal achieved.

In a sense, it was a victory which we were constrained to rejoice over in private, for no public announcement was then made that the line had performed successfully. As you all recall, it was about six months later that the completion of the line was announced to the public and a public demonstration of its performance vouchsafed. This also was a memorable occasion, with Dr. Bell present in New York and Mr. Thomas A. Watson, his famous assistant, receiving his words in San Francisco. On that occasion, in addition to a repetition of the historic sentence, "Mr. Watson, come here I want you," to which Mr. Watson commented on the difficulty of complying because of the intervening 3400 miles, Dr. Bell spoke also over a replica of the original telephone.

As I look back at those early days, it seems to me that the transcontinental line should go down in history for another reason; namely, that it inspired in the mind of Mr. Carty the idea of the roll call, an idea of which we have evidenced our approval by beginning today's program with it. And let me say also that, as we recall those early days, there is no memory

that comes more vividly to mind than that of Mr. Carty, who, with his enthusiasm, his courage, and his determination, was of such inestimable help to all of us in overcoming the difficulties with which we were confronted. In a very real sense the transcontinental line or lines—for, as you all know, we have four of them today, with many circuits on each—stand as one of his securest monuments.

A Vision to Fulfill

Nationwide telephony is the realization of a quite natural aspiration. We all recall those famous words of the charter of the American Telephone and Telegraph Company, written in 1885, which visualized Boston and New York as connected by "cable and other appropriate means with the rest of the known world." And this idea of nationwide service appeared in other places than in the charter of our parent company. Long before there was any such thing as nationwide service, Mr. Vail adopted as his slogan "One policy, one system, and universal service." It would be difficult to calculate the driving power which that apparently simple formula inspired in all of us in those early days. Fanciful though it might seem to the practical man, it was nevertheless a vision which we felt an unrestrainable urge to fulfill.

This, in turn, meant discovery and invention. It would have been quite impracticable to attempt the use of copper line wires large enough to preserve the telephone current in its flight across the country. A revivifying mechanism had to be found. At the Laboratories it was a problem never absent from our thoughts, and ultimately three promising solutions were found. With their installation at three points along the line of loaded No. 8 gauge wire—for example, at Pittsburgh, Omaha and Salt Lake City—transmission became possible between New York and San Francisco.

One of these repeaters was a sort of combination of telephone receiver and transmitter (the Shreeve repeater) which listened electrically to the speech coming in from a distant city and then spoke it out again to travel on still farther. Another device which did the trick was the Arnold repeater: a tube of mercury vapor through which flowed an electric current. There was a delicate magnetic control of this current which was operated by the incoming telephone current from the distant station; this changed the character of the current from the tube, giving to it speech significance; and the tube's current, similar to the incoming telephone current but much stronger, was sent on over the line toward the distant terminus. Both of these repeaters were successfully used in New York-San Francisco transmission during the first year that the line was open.

The Aladdin's Lamp of Telephony

Remember, this was back in 1914! Airplanes were still a novelty. There were no sound motion pictures. There was no radio telephony nor radio broadcasting. Today we think nothing of turning up the dial which controls the vacuum tube amplifier in our radio set so as to make the program louder. When we hear speech and music accompanying motion picture film we no longer remember that without speech amplifiers the sound could not have been recorded nor could it be reproduced to fill a large theater. Without those amplifiers, airplanes could not talk to their ground stations, and transoceanic telephony would be merely a dream or a futile wish. How easy today to say: "If the telephone current gets too feeble in its travel, put in amplifiers along its route." But in the days before 1911 there was no suitable amplifier.

It is about the third type of repeater that I wish particularly to speak. It proved to be the most powerful and flexible tool in the communication art. In its early stages of development this device, the so-called audion, also was a tube with some gas in it. Inside also was a small filament like that of an electric

lamp, together with some other wires for the control of the electrical condition within the tube. This was the form in which it was just being tried out in the art of radio telegraphy, where it was being used as a sensitive detector of wireless signals. For that purpose it had been invented by Lee De-Forest, whose name is familiar to all. Obtaining licenses under his patents, the Bell scientists undertook to make of this audion a reliable telephone repeater. Out of that undertaking have come not only the telephone repeater but many forms of high frequency generators, modulators, and valves of all sorts and all powers. It was a rubbing of Aladdin's lamp with a vengeance. It opened the gates into many new and fruitful fields.

The first thing we did was to create so good a vacuum within the glass walls of the tube that for all practical purposes electrical conduction occurred not by virtue of the gas but by a vapor of electrons. These are the tiny particles of electricity with which scientists were then just becoming well acquainted. The internal elements of the audion also required redesign to make the device an efficient amplifier for the delicate and complex currents of telephony.

Collateral Research Carried On

There were also many other researches which had to be completed successfully before the transcontinental line was possible. These would be too numerous to mention at this time. Some of them dealt with the line itself and others with methods of connecting repeaters into the line so that conversation could be amplified in both directions, while others represented improvements in the loading coil, which was then an important feature of long distance open-wire circuits but which has now all but disappeared from them.

Of all these developments, the electronic vacuum tube was perhaps the most significant. Its successful application to the

transcontinental line brought to light an unsuspectedly wide field of use. Not only had it dissolved the last remaining barrier to long distance telephony but it held promise of removing the most fundamental of the difficulties of radio telephony. We promptly began to study it from this standpoint, and within a year from the opening of the transcontinental circuit we succeeded, as you all recall, in transmitting speech from the United States naval antenna at Arlington, Virginia, to the Eiffel Tower antenna in Paris and also to improvised antennas as far away as Panama, San Diego, San Francisco, and Honolulu. Thus a new and attractive range of possibilities was opened. Distance no longer was a necessary limitation to telephone conversation. Wherever wire circuits were available or could be strung on poles or underground, telephony was possible without regard to distance. Wherever the route was inaccessible or wires could not be employed, a radio telephone path now became available. Today the telephone encompasses the world! Of the 39,500,000 telephones in service at the present time, 93 per cent of them can be reached by any Bell System telephone.

A Tribute to the Planners and Builders of the Line

Today we are primarily recalling the past. Mr. Vail, Dr. Bell, Mr. Watson, Mr. Carty, Mr. McFarland, Mr. Stevenson and others are no longer with us. But, fortunately, most of us who played any part in the creation of the first transcontinental line are still here to answer to the muster. It was of you who from coast to coast are now listening to me that, twenty-five years ago, Carty said, "We are proud of these men who are scattered all over the map today, who are not here in this room to hear these words of praise passed out to the Chief Engineer." It was you to whom he referred as "men in the Sierras with snowshoes, men in the badlands with mules and saddle horses, and elsewhere countless others who are guarding

the newly created line throughout its 3400 miles of length." It was of you he was speaking when he said, "Every one of them would stay at his post in time of flood, conflagration, or cyclone even until death," and of whom he finally said

'Tis not in mortals to command success,
But we'll do more, Sempronius,—
We'll deserve it.

But there is another reason why the first transcontinental line was an event in which we cannot help but feel proud to have participated. The instrumentalities which for the first time were tested out there have proved a rich heritage to our art. How many of us, twenty-five years ago, visualized our modern carrier systems, our coaxial cable, our overseas channels, and countless other present-day types of equipment which make telephony the daily servant that it is. Now that the world is encircled with our circuits, we can no longer call upon distance to be the touchstone of our success. We must invent new terms in which to express the progress which telephony will make. Speed and accuracy of service, and the provision of that service to all who may have occasion to require it, are now dominating objectives; and while it is more spectacular to announce that many thousands of miles of space have for the first time been subjugated and can be spanned in the twinkling of an eye, yet from the standpoint of the millions who use the telephone it is equally vital that another fraction of a second has been clipped from the average time of completion of the calls we handle.

But whatever the yardstick we employ for measuring the success of our nationwide integrated effort, it is through such recollections of the past as we are now indulging in that we renew our inspiration and strengthen our resolution in our attack upon the problems of the future. They are more numer-

ous and more of a challenge than ever. I feel sure that the Bell System, although now well advanced in years, is still young in victory and will have in the future many achievements to its credit which we will as gladly commemorate as we now commemorate the original transcontinental line.

Some Recent Advances in Rural Construction

IN an address given on January 14, 1927, President Gifford made this statement: "We aim to make it possible for anybody, any time, anywhere, to pick up a telephone and be quickly connected with anybody else, anywhere else, and talk as easily as though they are talking face to face, and at reasonable cost. That is the ideal that we try to measure our results by from year to year." There is no distinction here between the types of service, local or long distance, and this unequivocal affirmation of Bell System policy applies equally to the manufacturer in the city, calling his branch house across the country, or the farmer wishing to talk to his County Agent in the town five miles away.

The history of the United States, with its settlers striking out from the seacoasts in ever expanding waves to explore new territory and establish new communities, has been, as well, the history of transportation and communications in this country. Just as in the beginning the survival of the isolated settlements depended on their precarious communications by trail and water, the existence of this country as an indissoluble unit today depends on our closely knit network of communications, of which the telephone provides one indispensable means.

The trustees of this nation-wide web of telephone communications are the Bell System together with some six thousand connecting telephone companies throughout the nation. The Bell System, in sharing the stewardship of this great responsibility, is concerned not only with the problems of the large cities but, in furtherance of its objective of an integrated telephone service, is equally concerned with those of the rural communities. The cities are still dependent on the farmer and his

farm products, and the farmer must in turn rely on the city for his manufactured products. These are the business ties. Social ties between city and country become closer each year because of the increase in travel which accompanies highway development and also, in no small degree, because of the interchange of population between city and farm. Development of a comprehensive rural telephone service is just as essential to the attainment of the ideal expressed by Mr. Gifford as the provision of service to the cities.

In the case of the rural services, however, efforts to attain this ideal through improvements and extension have always had to contend with the relatively high line costs involved in providing such service. In contrast to the cities, where the telephone subscribers are closely grouped, with a majority at no great distance from the telephone office, the subscribers on lines serving farming areas are usually widely scattered. The average length of line required to reach each subscriber is necessarily great and, as a consequence, the cost of the line is high.

It is axiomatic that the value of telephone service to the user increases as the number of connected users increases. It is worth more to any user of the telephone to be able to talk with any one of millions of people than to be limited to any one of, say, a hundred people. This broad truism has particular application to those telephone subscribers, both business and residence, who live in the multitude of small cities and towns which are linked in many ways, both economic and social, with the rural population of the surrounding countryside. It follows that rural service is essential to the fullest value of service to telephone users as a whole. Therefore, advances in the art which will result in service improvements or reduction of costs, to the end that rural service can be made attractive to a larger number of subscribers, are of benefit not only to the rural subscriber but to the over-all service as well.

Continuous engineering and development effort has been directed at improvements in all phases of the rural plant, includ-

ing central offices, subscribers' station equipment, and outside plant. It is proposed here, however, to touch only on some of the advances which have been made in the provision of the necessary connecting facilities between the central office and the subscribers' premises. As indicated previously, one of the chief elements in the cost of providing rural service is that of the outside plant necessary to reach the scattered subscribers, and in the System's approach to the problem of reducing the cost of and improving the plant, two new forms of construction have been developed. The first is a type of open wire construction using spans, between poles, of 350 to 450 feet. The second is an entirely different approach, in which a new and special type of rubber-insulated wire is buried directly in the earth.

Long Span Aerial Wire

Up to a few years ago the connecting link between the central office and the rural subscriber consisted almost invariably of aerial wire, usually of galvanized mild steel. Taking both electrical and mechanical characteristics into account, the best steel wire then available required poles to be spaced not more than about 200 feet apart. Rural lines usually carry only small wire loads of two to ten wires, and the cost of the pole plant for carrying the wire represented a disproportionate share of the total line cost. To permit the use of longer spans, and thereby to decrease the number of poles needed, a new type of steel wire was provided, of much higher strength but still retaining substantially the same electrical qualities as the older wire.

The higher strength of the new wire permits the use of spacings between poles of 350 to 450 feet, or even more when the economics of the situation indicate longer spans to be desirable. At the same time, there is less likelihood of breakage under ice and wind loads or as the result of trees blown down in wind storms. As has already been demonstrated in service, this in-

creased wire strength, together with the greater resistance to permanent stretching under the heavy loads to which the wire may be subjected during storm conditions, makes for fewer service interruptions and opens the way to a reduction in the costs of maintenance.

To take full advantage of the high strength of this new wire required a better method of making joints in it than the twisting method formerly used. A solution of this problem was provided by the Bell System's development of a single-tube splicing sleeve into which the ends of the wire to be spliced are inserted, after which the sleeve is compressed tightly about the wire by rolling it in the standard sleeve-rolling tool. Such rolled joints, in addition to being as strong as the wire itself, are water- and air-tight, so that insurance is also provided against poor electrical contacts at splices, which have frequently constituted a serious difficulty with steel wire in the past when the twisted joint was used.

Economies of Long-Span Construction

When conditions permit straightaway runs, use of the new wire saves from 10 to 15 poles per mile. The loads which rural line poles are called upon to withstand are relatively small and, generally speaking, the diameter of the pole needed for adequate strength is about the same whether long spans or short spans are employed. Therefore, these savings in the number of poles required with long span construction are virtually net savings. Economies in pole maintenance are also effected by reduction in the number of poles, and the effects on conservation of pole timber are not to be overlooked.

In speaking of timber conservation, mention should be made that all but a small percentage of poles which are being introduced into the Bell System plant are treated with wood preservatives before installation. With the recent advances in

FIG. 1. RURAL CONSTRUCTION WITH 400-FOOT SPANS ON PRIVATE RIGHT-OF-WAY

FIG. 2

LONG SPAN RURAL LINES ALONG HIGHWAYS. DISTANCES BETWEEN POLES IN THE LINE AT THE RIGHT ARE ABOUT 350 FEET, WHILE THOSE IN THE LINE BELOW RANGE FROM THAT UP TO 425 FEET.

FIG. 3

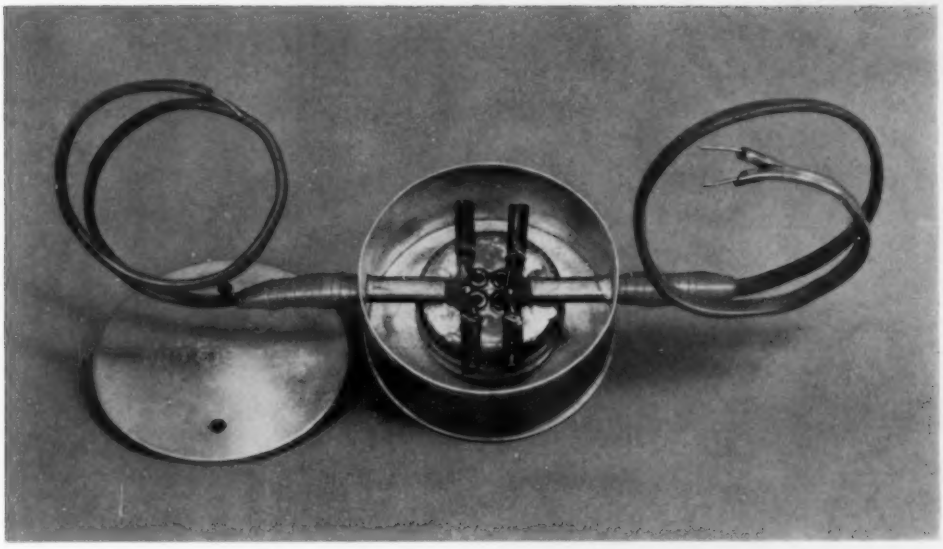


FIG. 4. A LOADING COIL FOR USE WITH U-WIRE CIRCUITS

FIG. 5. SPECIALLY DESIGNED PLOW LAYING TWO PAIRS OF UNDERGROUND WIRE AND BARE COPPER SHIELD WIRE IN ONE OPERATION

FIG. 6. EXCAVATION TO SHOW U WIRE LAID AT BOTTOM OF NARROW SLOT MADE BY THE PLOW.

FIG. 7. TERMINAL ON SHORT POLE NEAR HIGHWAY, FOR TESTING AND FOR CONNECTING SUBSCRIBERS' LEADS.

the technique of treating poles with preservatives prior to installation, and with the present high percentage use of poles impregnated with preservatives, it is expected that both the average life and the reliability of the poles in the rural plant will be materially increased, with consequent favorable reactions on the costs as well as on the dependability of service.

The long span rural open wire line shown in Figure 1, which is a 400-foot-span line in West Virginia, is typical of such construction on private right-of-way. Where, through cooperation of the farmer or land owner, such construction over private property is practicable, opportunities may be found to hold the length of the line to a minimum and to avoid undesirable and expensive construction along winding roads.

Figure 2 shows a two-wire line in Colorado, and Figure 3 is a four-wire line near Des Moines, Iowa. Both these lines represent construction along highways with the poles located close to the fence lines. Spans of approximately 350 feet were used in the line in Figure 2, and the line in Figure 3 was constructed with spans of 350 to 425 feet in length. It will be noted in Figure 2 that the use of insulators on wood insulator pins inserted directly into the pole is a different method of support from the standard arrangement of supporting them on brackets nailed to the pole, as illustrated in Figure 1. This particular method of Figure 2, which has already been tested in the laboratory, is now under service trial as a check to determine what advantages and disadvantages it may have, and is just one further illustration of efforts being directed toward improvement in rural service.

It may also be of interest to note that each of the three lines in Figures 1 to 3 is constructed of different pole timber. The poles in Figure 1 are creosoted southern pine, full length pressure treated, and chiefly 20 feet in length. Full length pressure treated creosoted lodgepole pine, 20 feet in length, was employed in the line in Figure 2. Northern white cedar poles 16 feet in length, and with the portion of the pole set in the

earth treated with creosote, were used in the line shown in Figure 3. These are all highly durable poles, and the choice of type of timber in any given location is dictated by considerations of over-all economy in that area. The fact that they are all treated with preservative permits, in general, somewhat smaller diameters than otherwise to be employed, since less allowance need be made in the size of pole for decay at the ground line.

Buried Wire

The successful use of buried wire at a cost which would permit it to compete with wire on poles demanded that the material cost of the wire be low, that an inexpensive means of placing it underground be provided, and that it be serviceable; i.e., that it have a reasonably long life in service and that it be not subject to troubles which would result in undesirable reactions on service or in high maintenance expense. Machine or hand trenching, which is the commonly used method of laying underground structures, is obviously much too expensive; so, concurrently with the development of a suitable type of insulated wire, work was also started on a suitable plow with which the wire could be placed underground rapidly and inexpensively.

Wire designed for burying directly in the earth (of which the standard designation is U Distribution Wire), as it was developed for the original field trials, consisted of a pair of parallel No. 17 gauge copper wires with a common covering of special rubber insulation over both wires. The problems in this kind of plant, so far as insulation is concerned, approach those of submarine cable design in that the insulation must be able to withstand what amounts to water immersion for many years. It must also be such as to minimize the transmission losses in the voice currents passing within it, and must have the requisite toughness to resist crushing and abrasion when placed directly in the earth without mechanical protection. Limited field trials were made of this original experimental wire in various parts of

the country under different climatic and soil conditions, for the specific purpose of discovering any weaknesses in it and of determining the general practicability of so placing wire underground.

It was found, among other things, that attack by termites is a factor to be considered. In the laboratory, under observation, no damage was done to test lengths of the wire by a colony of termites, but the insulation was found to be subject to attack when the wire was laid underground by the wire-placing plow. Regardless of why the insulation should have been attacked in one case and not in the other, it was evident that something was necessary to prevent it. To accomplish this, the method of insulating the wire was changed. Over the conductors there was placed first a layer of rubber compound identical in character with that originally used; this was followed by a second protective layer of a tougher composition containing an insecticide. In the wire now being used, a rubber of still tougher composition is employed for the second layer, which has definite advantages from the cutting and crushing standpoints and at the same time provides adequate insect protection.

Lightning also found the buried wire to be a convenient aid in dissipating its energy. Lightning striking the earth, trees, or other objects close to the buried wire raised the electrical potential of the earth about the wire to such an extent that, to reach the copper wire inside the rubber insulation, it punctured and damaged the insulation. The answer to this type of trouble, in areas subject to lightning, was to bury a bare lead-coated copper protection wire in the earth along with the U Distribution Wire, so that it would not be necessary for the lightning to puncture the insulation to find a reasonably attractive metallic path leading away from the vicinity of the lightning stroke.

Gophers and ground squirrels caused the greatest difficulty in territories where they are prevalent. In some instances the plow apparently placed the wire so as to obstruct the gopher burrow, and in an endeavor to remove the foreign object the

gopher destroyed the insulation. In others, the gophers or ground squirrels appeared to have damaged the insulation as the result of their efforts to follow the convenient small tunnel which the wire-placing plow provided through the earth and in which the wire lay. Up to the present time the most effective, although somewhat costly, means of dealing with the gopher problem has been to manufacture the wire with a thin steel tape armoring over the insulation.

Up to the end of 1938, a total of about 5,000 circuit miles of the U wire had been placed in service, and it is expected that this figure will have risen to almost 7,000 circuit miles by the end of 1939.

Advantages of Buried Wire

Study of the performance of this wire indicates that, with the effect of the shield wire in reducing troubles due to lightning, and aside from rodent damage in a few locations, the major sources of trouble have been damage by road maintenance crews, and small insulation injuries introduced during installation but not appearing as circuit troubles until the wire has been in service for some time. The trouble frequency has diminished greatly and progressively, however, as experience has been gained in the installation and maintenance of the wire. Many problems still remain to be solved, however, before the fullest potentialities of this type of plant can be realized.

With its invulnerability to sleet storm damage, and the avoidance of the periodic tree trimming frequently necessary with open wire, U wire is an attractive alternative to aerial wire construction. There is a wide field of use for both types of construction; and to obtain the best results from both service and cost standpoints, it is necessary that a judicious choice be made on the basis of the particular local conditions to be met. Where roads are winding and tree conditions bad, or where aerial wire corrosion is severe, U wire should have a considerable advantage over open wire from the standpoint of better and more

reliable service, and may be the means of effecting appreciable economies, not only in first cost but in maintenance as well. On the other hand, where the conditions are reversed and subsurface conditions are not favorable to the use of buried wire, due to the presence of rocks, tree roots, hard clay, gophers, etc., long span aerial wire may be much more economical.

The voice currents attenuate, or weaken, at a somewhat greater rate per mile of circuit when transmitted over U wire than in the case of open wire. To compensate for this in circuits to distant subscribers, loading coils are inserted in the line at suitable intervals. The loading coils (see Figure 4) are enclosed in small watertight cases suitable for burying directly in the ground and are equipped with rubber covered leads which can be connected directly to the U wire with the usual vulcanized rubber splices.

As indicated previously, since it was realized that the successful use of U wire was contingent on the provision of an inexpensive means of placing it underground, the development of the wire itself was paralleled by development of a suitable plow. The standard type of plow designed for installing main runs of U wire, usually along the shoulders of roads, will install at one operation from one to four pairs of U wire, and can be used as well for the burying of small cables. This plow,* coded as the WC plow, is shown in operation in Figure 5 plowing-in two pairs of U wire plus the bare copper lightning protection wire, which is shown carried on the small horizontally mounted spool. The WC plow can be used to place U wire at various depths ranging from 12 to 24 inches. The normal depths are 16 or 20 inches.

A small plow, known as a 17–T plow, is sometimes used for plowing-in wires to subscribers' premises. Experimental work is also being done on a type of plow intermediate in size between the WC and the 17–T plows, which will be sufficiently light and

* Note: For a more complete discussion of cable- and wire-laying plows used in the Bell System, see the article by T. C. Smith in the BELL TELEPHONE QUARTERLY for July, 1939.

inexpensive to allow them to be located at strategic points to facilitate plowing-in short extensions or connections for new subscribers. It is planned to make this unit of such size that it can be pulled through the ground by a standard construction truck, either through direct connection or by means of the truck's winch line.

Each of the larger reels shown in Figure 5 carries about one half mile of U wire. Splicing of one reel of wire to another is accomplished by joining each of the two copper conductors with a pressed sleeve and vulcanizing a covering of rubber over the joint. This vulcanizing is done in an electrically heated mould operated from a 6-volt storage battery, one fully charged battery being sufficient for 25 to 30 splices.

A special test set has been provided for continuous connection to the wire during the plowing-in operation. This gives an immediate alarm in the case of damage to the insulation, making it possible to locate and correct it immediately.

Features of Plowing-in the Wires

In its passage the plow creates little disturbance of the earth. After the plow has passed, it is the practice to drive the wheels of a truck back and forth along the ridge of surface soil left by the plow. This simple operation is ordinarily sufficient to press the disturbed surface layer back to its original condition. After a rain has erased the tire marks of the truck, it is frequently impossible to detect on which side of the road the installation has been made. Figure 6 shows an excavation down to the wire as it lies at the bottom of the narrow slot made by the plow. The plow makes a remarkably clean cut with but a minimum disturbance of the surrounding earth when, as in this instance, the soil is not too dry and no interference by large rocks or other obstructions is encountered. Under certain conditions, however, there is initially a somewhat greater superficial disturbance of the top layer of earth than appears here, the low ridge behind the plow in Figure 5 being perhaps more

characteristic than the soft, turf-reinforced layer of top soil in Figure 6. However, the surface is quickly and effectively restored to its original condition by the method mentioned earlier in this paragraph.

To facilitate sectionalizing the wire for test purposes, all bridged connections, such as branch leads, subscribers' loops, etc., are made at terminals rather than by buried bridged splices. The main run of U wire may be carried into the subscribers' premises and terminated at the protector for the subscribers' station or, if this would necessitate an excessive length of wire, a special terminal, shown in Figure 7, may be mounted on a short pole or stub near the highway. Connection to wire leading to the house is made at this point. Such terminations, which normally occur at reasonably frequent intervals, serve as test points; but where the house services or other branching points are widely separated, test terminals are so located along the line as to separate the wire into sections of a suitable length for testing.

This account has touched on a few of the more recent developments in outside plant which are directed toward the improvement and extension of rural service. It must be remembered, however, that the outside plant represents only one phase of the service problem. The over-all program for the widening and betterment of service to the rural user has required paralleling advances in all the other branches of the telephone art as well. The present discussion may be taken, none the less, as indicative of the whole broad and continuing program which brings about with the assistance and coöperation of the connecting companies, the steady improvement of rural telephone service. In this as in other ways, the Bell System seeks to attain more and more nearly to that ideal of universal service, held since the beginnings of the business, which Mr. Gifford expressed so succinctly and objectively in the words quoted at the head of this article.

RAYMOND C. SILVERS

Public Telephones

ONE day last spring a tired circus roustabout lay sleeping underneath a red and gilt wagon on the outskirts of a southern city. The big top had been raised and animal vans hauled into position; everything was almost ready for the coming of the crowds. At the last minute, however, one of the wagons had to be moved. No one noticed that beneath it a man lay sound asleep. The order was given, the great wheels turned. Instantly there was need for a doctor, an ambulance, hospital facilities—and instantly the cry arose, "Is there a telephone around here?"

There was indeed: a public telephone in a mobile telephone trailer, parked in the shadow of the tent itself. Service had been connected only a few minutes before. The call for the ambulance was the very first call. Once again a public telephone proved instrumental in the effort to save human life.

The use of trailer telephones in a few areas is a recent development. It is regular practice, however, to install temporary public telephone facilities wherever they are required, and this story is no more unusual than many which might be told to suggest the limitless range of events in which the public telephone takes part. Two or three others will help to accent even more strongly the problem of giving a practical answer, in terms of prompt, reliable and courteous service, to the question, "Who wants to make the next telephone call, and where?" For instance:

A young couple visiting New York become separated in the crowds at Times Square. Two minds with but a single thought —*telephone!* Within a few minutes of each other, from booths but a few yards apart, both husband and wife call their home in Philadelphia. He leaves word where he will be; she gets the message; reunion.

Into Norfolk and Yorktown harbors sail the combined Atlantic and Pacific fleets of the United States Navy. Nearly 50,000 men disembark after months at sea. Waiting to serve them are rows of public telephones, specially installed.

A young woman of foreign birth hurries into an attended telephone station. Member of a family of political refugees, she is alone, distracted, forgetful of the name of the hotel where she was to meet friends. Unable to speak English, she just succeeds in making it known that the hotel name begins with R. Thanks to the telephone and the ingenuity of the attendant, she finds her friends that same evening—even though the hotel name (as it turned out) really began with a K!

A visitor to the observation tower of the Empire State Building says to himself, "Wish I could call Mary and tell her I'm phoning from the top of the world." He can. There's a public telephone there. If he ever climbs Pike's Peak, he'll find another.

Public Telephones Meet Two Kinds of Need

Those are but half a dozen of the more than two billion calls which are placed from Bell System public telephones in the course of a year. They are enough to indicate one broad purpose of this service, which is to make it easy for people who are away from their own telephones to talk with others whenever the need may arise. A second purpose, no less important, is to make sure that telephones will always be available to people who are not regular subscribers but who have need, frequently or infrequently, to use them.

Every day thoughts like these run through the minds of millions:

I *must* call him—
I *ought* to call her—
I wish I *could* call them—

To meet that necessity, that obligation, that wish—to meet them as nearly as possible under all conditions, at any time, at any place—public telephone service is provided as an essential supplement to other telephone facilities. Best indication of its importance is the enormous use made of it. Last year about one twelfth of all calls which originated within the Bell System were made from public telephones. That means, on the average, 70 calls each time your watch ticks, day and night—4,200 calls a minute, more than a quarter of a million every hour.

These calls are made from nearly 600,000 Bell System public telephones all over the land. Generally, the heaviest use of the service is in the nation's largest cities. The single area of greatest use (in relation to the number of residents) is Manhattan Island in New York City. Factors contributing to this seem apparent: the enormous daily non-resident population, including hundreds of thousands of visitors as well as commuters; the pace and complexity of life, which increase occasions when there is need for instant communication; the incessant requirement for travel which keeps multitudes on the move and at the same time necessitates continuous making and changing of plans.

For the most part, telephone company attendants are not required at public telephone locations. At certain strategic points, however, where crowds are thickest and numbers of people may need assistance, attended stations are provided in addition to coin facilities. In great metropolitan railway terminals, for example, skilled women, drawn from the ranks of central office operators and specially trained for their work, help to speed the flow of calls. They answer questions and make change. They help people who are lost to find their friends. Occasionally they find and return objects of great or little value which have been left in booths—jewels, cameras, and once at least the deed to a piece of property! Above all, however, they help anyone and everyone—breathless commuters, country cousins, you and you and you—to obtain fast, pleasing, personalized telephone service.

Here we have been speaking of a phase of big-city service. Let it not be forgotten, however, that east, west, north and south, in cities of all sizes, in prairie towns and mountain towns, anyone who wants help in making a call may obtain it from the central office operator.

From most metropolitan attended stations, by reason of their location, a large share of calls go to out-of-town points. On the whole, however, public telephones are most frequently used for local calls. About 88 per cent of the coins deposited in coin collectors, it is estimated, are nickels. Nine per cent are dimes and three per cent are quarters.

Choosing Locations for Public Telephones

Frequently the question has been asked, "Where are the busiest public telephones in this country?" Some of them are in a New York drug store near Times Square, where nearly a thousand calls a day keep eleven telephones very busy indeed. But the public telephone man who is asked this question will, in answering it, take pains to point out certain facts. He will remind you that if the usage of any one telephone climbs too high, it's time to put in another—either in the same location, if there's room, or else nearby. He will explain that one of his own big jobs is to make sure there are enough public telephones in the places where people want to use them. He'll make clear that the idea is not to get the last possible ounce of use out of a single instrument by having people stand in line to use it, but to meet the convenience of the public.

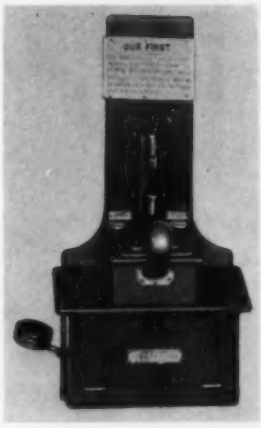
Who is this public telephone man? He's the man responsible for seeing to it that the world and his wife can always find a public telephone handy. In small communities he may perform this duty along with others. In most large cities, however, public telephone representatives are engaged in the work full-time; and their job requires, in full measure, alertness, experience and judgment.

Here's a new store being opened. Should it have a public telephone or not? That will depend on the answers to an astonishingly long list of other questions. The representative checks the location and number of other public telephones in the vicinity, finds out how much they are used, asks himself if installation of a new one will result in added public convenience and usage or merely take business away from those already in service. He notes the volume of pedestrian and automobile traffic, looks to see if a motorist who wants to make a call will be able to park his car. He ascertains the approximate number of people in the neighborhood who don't have telephones in their homes. He asks if the new store will be open earlier or later than others nearby, judges its appearance, estimates the probable extent and type of patronage. Only when he has gathered his facts and arrived at a considered judgment does he give his answer.

At this point we must supply a definition. What is a public telephone? Ask the man in the street and he'll probably say, in effect, "A telephone for public use—one that anybody can use for a nickel." And that's right. To the man in the street, any coin telephone is public and he is free to use it. Actually, however, there will be wide public usage only at certain locations; at others, coin telephones will be used by a limited number of people. Under the general heading of public telephone service, therefore, we find both *public* and *semi public* service. The total number of Bell System public telephones is about evenly divided between the two types.[1]

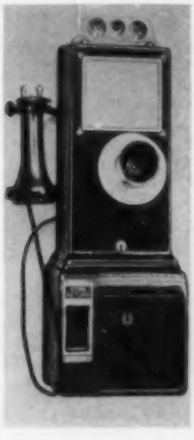
Public service is provided at locations where it will best meet the requirements of the general public. It is installed by the telephone company on its own initiative, in agreement with the occupant of the premises. The latter provides the space, keeps the booth clean, and makes change. For these services

[1] Figures in this article relate to all public telephones, including those which are semi public.



In the Center Above Is the First Coin Telephone Apparatus of the Gray Telephone Pay Station Co. (Transmitter and Receiver Not Included). The Date Is 1889. Directly Above, a Later Gray Model, with Coin Slot in the Big Bell. Below, Western Electric Single-slot Prepayment Model, 1904.

Above, Baird Mfg. Co. Instrument, with Lever, Produced Around the Turn of the Century. In the Center Below, a Gray Five-slot Coin Telephone, with Arm Rest, 1898. Directly Below Is the Type of Coin Telephone First Standardized for Bell System Use in 1911. In Appearance it Closely Resembles the Modern Instrument at Left.



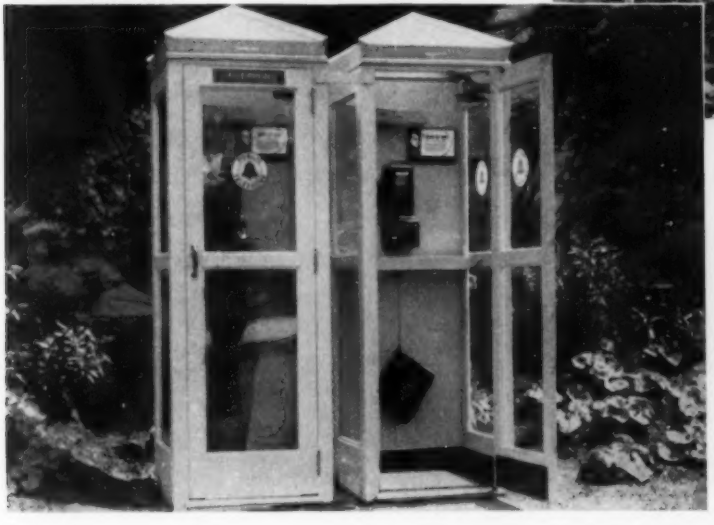
BOOTHS OF YESTERDAY AND TODAY. THE PICTURE BELOW ILLUSTRATES A TYPE OF BOOTH WIDELY USED IN THE 1890's; HOTEL PATRONS, ACCORDING TO STORY, SOMETIMES MISTOOK BOOTHS LIKE THIS FOR ELEVATORS. AT THE RIGHT IS A TYPICAL MODERN BOOTH.

TRAILER USED TO FURNISH PUBLIC TELEPHONE SERVICE AT TEMPORARY OR EMERGENCY LOCATIONS, AND ALSO ON SPECIAL OCCASIONS AS A TELEPHONE EXHIBIT

ABOVE: SKILLED AND FRIENDLY PERSONAL SERVICE IS RENDERED TO THOUSANDS EVERY DAY AT ATTENDED PUBLIC TELEPHONE STATIONS.

RIGHT: "THE TOPS" IN PUBLIC TELEPHONES — THE FAMILIAR BLUE BELL ATOP PIKE'S PEAK GIVES NOTICE OF THE LOFTIEST PUBLIC TELEPHONE IN THE UNITED STATES.

BELOW: MEETING A SPECIAL OCCASION: PUBLIC TELEPHONE FACILITIES AT THE GOLDEN GATE INTERNATIONAL EXPOSITION, SAN FRANCISCO, INCLUDE 75 GLASS-ENCLOSED OUTDOOR BOOTHS LIKE THESE PICTURED HERE.



LEFT: COLLECTING A COIN TELEPHONE. CASH RECEPTACLE HAS BEEN REMOVED AND PLACED IN CASE ON FLOOR. EMPTY RECEPTACLE IS BEING INSERTED AND COLLECTOR IS ABOUT TO REPLACE DOOR ON COIN COMPARTMENT.

ABOVE, RIGHT: COUPE TYPE AUTOMOBILE FOR SEALED RECEPTACLE COIN COLLECTION WORK. COMPARTMENTS WITHIN SUCH A CAR WILL ACCOMMODATE 16 NINE-RECEPTACLE CARRYING CASES.

RIGHT: INTERIOR OF CAR, SHOWING COMPARTMENTS OPENED. THE CARRYING CASES REST ON SLIDING TRAYS AND ARE ALSO ACCESSIBLE FROM THE REAR.

BELOW: COUNTING COINS. REVERSIBLE RACK IN BACKGROUND ACCOMMODATES TWO CARRYING CASES. COUNTING MACHINE AUTOMATICALLY SORTS, COUNTS AND REGISTERS NUMBER OF NICKELS, DIMES AND QUARTERS.

he ordinarily receives a commission based on the use of the telephone.

Semi public telephones are installed for a combination of subscriber and public use at locations where public telephones are not warranted—often, for example, in clubs, apartment houses and college dormitories, or in filling stations, barber shops, bowling alleys and many other places where occasional transient visitors, as well as the subscriber, will have need for the service. A minimum charge applies, and if the coins collected for local calls fall short of this minimum, the subscriber agrees to pay the difference. Most semi public telephones are listed in the directory, whereas public telephones usually are not.

The Job of Administration

Now let's get back to our representative. Day in and day out, he keeps in touch with the places where public telephone service is provided. Take that restaurant around the corner. Its business is growing. Nowadays, during busy hours, people have to wait outside its single booth. There's room for another, but the proprietor isn't sure he wants the space used. Time to drop in and talk the matter over with him again. Then another location to be visited . . . another . . . another. Here's a telephone without a booth; putting one in would double convenience and usage. Here's another in the back of the store; better talk with the storekeeper about putting it up front. Wonder if we don't need a better sign near that subway entrance. . . .

Into the office of the public telephone manager come reports of new buildings going up, of structures being remodeled. In addition, he reviews his entire territory periodically to make sure that coverage in each neighborhood is adequate but not excessive. Coming events which may increase demand for service are anticipated; to give one obvious instance, about

1,000 public telephones were installed at the New York World's Fair and about 300 at the Golden Gate Exposition in San Francisco. And all the time, while keeping watch over these matters, the public telephone office must carry out a second major responsibility, the collection and counting of millions of coins.

The way this is done is extremely important to telephone *users* as well as to the company. In the first place, coin telephone service is far more costly to install and operate than ordinary service. Particularly in view of this, collection costs must be kept moderate; otherwise it would be difficult to offer a service as widespread and convenient as this country enjoys today.

Second, the companies must make an accurate accounting to all who have public or semi public telephones on their premises.

Finally, the coin receptacle will hold so many coins and no more. A "full box" means that the telephone will not work. Therefore the collector must arrive when it is reasonably full, but not quite; and there must be a margin of safety to provide for possible extraordinary use of the telephone between the collector's visits. Some telephones are used incessantly, while at others the usage is relatively light. Accordingly a "skip-stop" collection procedure is generally followed, under which different public telephones are collected at intervals ranging from one day to as much as three months. This makes for efficiency not only in the collector's own job but also in counting coins and rendering statements.

Proper scheduling of collections takes both knowledge and judgment. Of two telephones in the same store one might say, "Collect them both at the same time." But the public telephone man knows that in most cases the one nearer the door is used much more often, and therefore must be collected more frequently. He knows there are seasonal variations in usage, that the winter schedule must be modified when summer comes. He knows that a public telephone along a city subway

route will hold more coins than one in a store a block away. Why? Because the vibration from passing trains causes the coins to pack closer together.

For many years the Bell System has made careful and effective studies of coin collection methods. More than a quarter of a century ago attention was first turned to development of a cash receptacle which would lock automatically when removed from the telephone. Since the early 'twenties, use of self-locking, sealed receptacles has been extended into many areas. The collector merely takes out the filled receptacle and inserts an empty one; the one he has removed, bearing a number associated with the number of the telephone, is then brought back to the telephone office, where a designated individual breaks the seal. The coins are next placed in a machine which automatically sorts and counts nickels, dimes and quarters, registering the value of each on a meter. The procedure is simple (having the simplicity which comes after long study), permits easy verification of figures, and helps to insure accurate accounting.

Speed is important too. In a single year more than 6,000,000 collections must be made. Thanks to continuous improvement of methods, collectors are now able to complete an average of 80 to 100 collections apiece in a normal working day. The effort behind this efficiency extends likewise to improvement of the equipment collectors use, the cases in which cash receptacles are packed, the cars which carry the cases.

Early Ventures in Coin Service

Yet this effort is only a fractional part of the study and research which have been required to develop public telephone service. Many minds within and without the Bell System have helped to forward that development. Especially in the selection and practical application of ideas to public service—in the design of mechanical and electrical features promoting efficient operation and in the reduction of numerous cost items

—the contributions of the Bell System have been outstanding.

Scarcely five years after Alexander Graham Bell took out his first patent, other men were beginning to wrestle with the difficulties of producing a coin telephone. Most of the earliest devices made the telephone, or some part of it, inaccessible to use until unlocked by deposit of a coin. For example, the coin unlocked the crank with which the user signaled the operator, or it unlocked a sliding door in front of the mouthpiece, or the entire telephone was enclosed in a box. One inventor reversed the usual order: The telephone was located in a booth having a door which locked behind the user when he stepped inside. After he had made his call, he could escape only by depositing a coin in the door lock!

A fundamental defect in most early devices was that if a call could not be completed, there was no mechanical means of giving the customer back his money. One attempt to remedy this difficulty relied on nothing more or less than a piece of string. The coin, when first deposited, reached an intermediate stage in the mechanism. If the call was completed the operator could, by electrical means, cause it to fall into the cash box. Otherwise she asked the customer to pull the string, whereupon the coin was supposed to fall out.

Still another device, as early as 1886, provided for electrical return of the coin. Between theoretical and practical operation of these early machines, however, lay a considerable gap—a yawning gulf, if you wish. Also, in the 'eighties, all telephone service was limited in extent: quality of voice transmission, judged by modern standards, was poor; subscribers were scarce. Development of *any* service was the great problem, and the first task of research was to effect technical advances which would hasten over-all service improvement. It was only natural that intensive development of coin machines should await the time when the success of other efforts had created a need for them.

This is not to say that there was no requirement for public telephone service. In some places the company provided an

attendant to make connections and collect charges—the latter sometimes failing to add up to the amount of the attendant's salary. At first, in small communities, the only telephone in town might be the public telephone in drug store or railroad depot, where druggist or station master acted as the company's agent. This agency arrangement was widely followed. Hotel clerk or storekeeper placed the call, ushered the patron into a booth, timed the connection and collected the money. At the Grand Central Terminal in New York, where permission to install a single public telephone was granted (apparently with some doubt) in 1889, this became the responsibility of the manager of the Bureau of Information. If he were still doing the job today, he would have 230 public telephones to look after.

One of the most widely used early booths was the Jamestown booth, so called because it was manufactured in Jamestown, N. Y. Multi-paned windows and silk curtains revealed a taste in keeping with the elegance of contemporary hotels. The accompanying picture will perhaps make clear why hotel patrons sometimes waited in front of a Jamestown booth in the belief that it was the elevator. Inside, usually, was a cabinet desk set; that is, a long-necked telephone mouthpiece projecting over a desk on which notes might be written. With each cabinet came a revolving stool similar to a piano stool. On at least one occasion, according to a pioneer telephone man who has spent his life in public telephone work, an agent requested two stools, on the ground that he had twin daughters studying the piano!

Prepayment vs. Postpayment Instruments

The first public telephones undoubtedly did much to advertise the service. As subscribers grew in numbers the potential usefulness of coin machines sharply increased, and during the 'nineties there was distinct quickening of effort to produce satisfactory apparatus. One manufacturer after another entered the field; by the early 1900's no less than 25 concerns were making coin collectors.

The first machines, as mentioned above, followed the principle that the user should deposit the coin first, then make his call. In other words they were *prepayment* machines. Not for many years, because of the difficulty of returning the coin, was a reasonably successful mechanism of this type developed. Around 1900, however, the Western Electric Company introduced a coin collector which represented a distinct advance over all other prepayment apparatus. This was a single coin machine accepting nickels only and was widely used for local calls. Operating methods varied in different cities, but in some places deposit of the coin lighted a lamp in front of the operator, who could either collect or return the money by moving a key on the switchboard.

There was still no satisfactory multi-coin prepayment collector which might be used for toll as well as local calls. Returning several coins was much more difficult than returning one. To avoid the money-return problem, during the 'nineties *postpayment* machines had been developed—that is, the customer reached the operator by lifting the receiver, and deposited the proper coins only if the call went through. Plungers or levers were first used to let the operator know that the coins had been deposited. The person at the telephone would drop a coin in the slot, then push the plunger, or pull the lever. Each push or pull produced a characteristic sound to the operator, varying with the coin deposited: for example, in one machine, a deep gong for a nickel, a rasping sound for a dime, and a high-toned gong for a quarter.

One day a workman in the factory of the Gray Telephone Pay Station Company accidentally dropped a coin. It landed on a bell. Immediately there came to William Gray (also the inventor, several years before, of an inflatable chest protector for baseball catchers) the idea of letting the descent of the coin produce its own signal. Thus, according to story, was discovered the principle now generally followed. Some of the first "gravity" coin collectors accepted halves and silver dollars,

and the falling of a "cartwheel," as you may imagine, made a real noise, half bell and half rattle.

For a number of years, however, gravity machines were only one of the many types on the market. General staff engineers of the Bell System were well aware that this multiplicity of devices presented a serious obstacle to the development of efficient and satisfactory service. Starting in the early 'nineties, they regularly examined and tested all kinds of machines, rejected many whose use might have caused infinite trouble, suggested improvements in design and in the quality of finished product, developed and improved circuits and central office apparatus associated with the operation of coin collectors.

Telephone engineers well knew, also, that postpayment machines could not be the final answer for a rapidly growing service. One reason was that the postpayment method requires the operator to perform an appreciably greater amount of work on each call. In small exchanges, where there may be relatively few calls from public telephones, the additional work is not an important factor. Certain toll calls, too, may best be handled by requesting the deposit after the distant telephone has been reached. But in the large exchanges which handle the great main stream of public telephone calls, the prepayment method is faster and more satisfactory both to the customer and the company.

Continuing Progress on a Broad Front

In 1911, after exhaustive study and test, a three-slot prepayment coin collector designed by the Western Electric Company was standardized for general Bell System use. It employed, in combination, the best principles advanced up to that time. Certain essential features were the work of independent inventors, notably the Gray Company; others derived from the experience and research efforts of Bell engineers. This machine has since been improved in numerous details, but its

basic design has been proved sound during a period of tremendous growth.

So vast has this growth been that modern public telephone service must be operated under all sorts of conditions of climate and use. Nothing but an apparatus of the utmost precision will give satisfactory performance. Nor are equipment problems confined to the coin telephone itself. At many of the locations where service is urgently needed, there is a maximum of noise and a minimum of space. The booth which suits the lobby of a luxurious hotel would warp and split by a seashore boardwalk. In a busy corner cigar store, stoutly bound directories will be worn to pieces in a few hours unless special measures are taken to protect them.

So we find work to improve and extend the service proceeding on a broad front. Doors which fold in and leave the booth open to the air of the room were introduced more than 25 years ago. Since then booths have become more convenient, better lighted, better ventilated. There has been constant study of materials—of woods and glues impervious to rain and salt spray, of metals, of methods of acoustical treatment. For roomy locations where customers may want to make numerous calls in sequence, a larger booth with a swivel chair is often provided. Ready reference cabinets and tables facilitate the use of directories at busy big-city corners; as an incidental result of their improvement, certain directories which once had to be replaced almost daily now require replacement only once or twice a week.

With increased utility has come improved appearance. Public telephone installations in new or remodeled buildings are designed to conform with the general architectural treatment. Harmonizing woods and colors are employed, mouldings and trim applied to carry out the prevailing decorative scheme.

Each refinement, no matter how small in itself, is expressive of Bell System effort to make public telephone service continuously better, not merely in some respects, but in all respects.

PUBLIC TELEPHONES

In the United States today, more people use more public telephones more often than in any other country in the world. A recent survey in nine American cities showed that of several thousand people interviewed who had no telephones at home, more than half lived within about a two-minute walk of a public telephone and only about one in six were more than four or five minutes' walk from one. For them, as for the hastening traveler, the reporter bursting with news, the salesman ringing up country customers before he heads for the next town—for all who have need of a telephone *here* and *now*, on matters momentous or trifling—public telephone service is ready and waiting to carry the message quickly, clearly and at low cost.

PRESCOTT C. MABON

Safety in the Bell Telephone Companies

AS TWO telephone men were preparing for a toll line inspection trip early one morning, the roar of an airplane motor, unusually close, attracted their attention. They saw a large tri-motor plane flying very low over the town, traveling at a rate of speed well below normal and with a very definite list. They had covered only a few miles on their trip when they saw the wreckage of the plane in a freshly plowed field. They left their car and hurried to the wreck. The pilot was dead, the remaining thirteen people aboard the plane all seriously injured. One telephone man asked his fellow worker to call ambulances and doctors. He then organized a rescue squad, and directed the removal of the injured. He warned onlookers to stop smoking, since the wreck, the passengers, even the rescuers were soaked with gasoline. The only ambulance available could carry but three of the injured. He quickly arranged for the others to be taken to the hospital in private cars, and assisted in placing them in the cars. He aided the small hospital staff in caring for the injured, and summoned physicians and nurses from neighboring towns. His treatment of the injured was so efficient that he was credited with a substantial part in the saving of many lives.

A cage in a mine dropped sixty feet, killing one man and injuring two others. A telephone repairman working nearby was asked, because of his known competence in first aid work, to go down another shaft with two miners to care for the injured. He made a perilous journey along an abandoned underground route to reach them. He utilized available material to control bleeding, to care for other serious injuries, and to improvise stretchers. He supervised the removal of the

men. And as a result of his competent and effective work, one of the injured men recovered.

A cable splicer and his helper were working at a manhole when an automobile and a motorcycle collided nearby. The telephone men ran to the assistance of the two boys who had been thrown into the road. They applied a tourniquet to stop arterial bleeding, covered the open wound of a compound fracture with a compress, and administered ammonia inhalants to counteract shock. They arranged for the calling of an ambulance, and attended the boys until the ambulance arrived. They then assisted in placing the more seriously injured boy in the ambulance. Their immediate application of first aid undoubtedly saved this boy's life.

So read the records of but a few of the acts of noteworthy public service for which Vail medals have been awarded. Since the establishment of the Theodore N. Vail Memorial Fund in 1920, 1,093 awards have been made to employees for acts reflecting the responsibility for public service traditional in the Bell System. The cases described above, and many others, are significant because the application of first aid, as taught by the telephone companies, was an important factor in the actions cited in the awards.

A large proportion of the 82,000 plant men in the Bell Telephone Companies have received this first aid training, which has been carried on with the assistance of the American National Red Cross. Some first aid training is also included in the health courses which are provided for women employees of these companies. These men and women, on their regular jobs, are scattered all over the country. Hardly a day has passed since the introduction of first aid training in the Bell System that has not recorded somewhere some act that illustrates the value of this training both to the employees and to the public at large. Recognition of some of the important outstanding

acts of this character may be found in the records of the President's Awards of the National Safety Council and in the records of the awards of the American Red Cross, as well as in those of the Vail Medal Awards.

Significant as is this record of saving lives and of preventing minor injuries from becoming serious, the most important contribution of first aid training for telephone employees is its effect in reducing the number of injuries to employees or caused by employees. Persons trained in first aid have a better understanding of the seriousness of injuries, and the record of 25 years shows that they are more careful to avoid getting hurt and to prevent others from getting hurt. Consequently, the continued teaching of first aid, and the stimulation of interest in some of the Companies through first aid contests, as shown in the accompanying pictures, have become a vital part of the safety program of the telephone companies.

Safety Activities

One significant aftermath of the 1938 hurricane—the worst disaster that ever hit the Bell System—was the excellent safety record of the plant forces who worked to restore telephone service in the New England States. About 2,400 men were brought on from states as far south as Virginia and as far west as Nebraska and Arkansas to assist the regular plant forces of the Companies affected. The combined forces worked seven days a week, from dawn to dark, and under unusually hazardous conditions. Yet they performed their urgent tasks as safely as when working the same number of hours under normal conditions.

Because of such remarkable safety records made during emergencies, and also because the employees of the Bell System have relatively fewer accidents on the job than when off duty, it may seem that some spectacular safety program has been adopted. As a matter of fact, the opposite is true.

Progress is attributable mainly to one simple principle: that of making safety a fundamental requirement of every job.

Effort is concentrated upon preventing the accident before it occurs—the safety equivalent of locking the barn door before, not after, the horse is stolen. From a study of past history, it is known that an accident is usually the result of some error, either in plant or equipment or in methods of doing the work. It therefore follows that if the error is eliminated, the possibility of an accident will be removed. This elimination of errors, either actual or potential, is what the Bell System safety efforts are designed to accomplish.

Briefly, the safety activities, in addition to the first aid training, may be summarized as follows: both men and women employees are selected and assigned to work on the basis of their physical and mental qualifications; they are trained in the safe method of performing their jobs; they are provided with tools, material, and equipment particularly adapted to the work to be performed; and they have supervisors who are definitely "safety conscious."

Training the Telephone Man

From the time a man is hired, he is taught that only work safely performed is well performed, and that he is not doing a 100 per cent job until he can do it safely: without being a hazard to himself, his fellow-employees, or the public.

The nature of the telephone business is such that much of the work is done without direct supervision. For example, Mrs. Jones needs a telephone, and makes the necessary arrangements through the business office. A short time later the installer from the telephone company arrives to put in her telephone. He consults her as to where she wishes the instrument, decides the best way to run the wire, makes the installation, and tests the line to be sure all is working well.

Now, from the time that installer left his headquarters, he has probably been entirely on his own. He may have driven

a light truck to the subscriber's premises, meeting the hazards of present day traffic on the way. While installing the telephone, he had to use many different tools, run wire, climb ladders, and perform various other operations, all without direct supervision. There was nobody with him to say "Better get the stepladder from the truck rather than stand on that chair," "Put on your goggles before drilling through that brick wall," "Got your safety strap properly fastened?" "How about the pole you are about to climb? Do you know it's safe?," or to remind him of any number of things he has to think about if he is to finish the job safely and efficiently. Only a trained man can do that sort of job unsupervised. And so the telephone workman is a trained workman, trained to do his job the "safe way."

Some of this training he may receive in telephone schools; other training he receives out on the job, working with an experienced employee, under direct supervision. But no matter where he receives his training, he is drilled and re-drilled in the operations themselves, not merely told how the operation should be done. In other words, he learns by doing, and by doing the safe way.

The above indicates in a general way the type of safety training a new employee receives. Equally important is the retraining of older employees who may be transferred to work with which they are not completely familiar. Also, the constant improvement in the telephone art, resulting in new and better tools and equipment, as well as in better and safer methods of doing the work, calls for continuous training of every plant employee.

Special safety training in selected plant operations is given from time to time. For example, a number of Bell System Companies have developed courses in the correct operation of motor vehicles, which are given to employees before they are permitted to operate company vehicles. The courses emphasize courtesy on the highway as well as the mechanics of driving

and traffic regulations. The type of equipment used by one of the Companies in demonstrating various traffic conditions is illustrated on another page.

A pole, ladder and electrical safety demonstration board has also been developed, as shown on an accompanying page. The board is made so that almost any type of plant condition which has caused injury in the past from falling poles or ladders or from electrical shock can be simulated. Thus the telephone men are given another opportunity to learn lessons from experience, so that their day-to-day jobs may be safer.

Monthly Bell System posters are also used to supplement other training of employees in the formation of safe working habits. It will be noticed from the accompanying illustrations that these are definitely training instructions, each carrying the same message although the subject matter may vary: "Here is the right, and therefore the safe and efficient, way to do the job." Reminding the employee how *not* to be hurt, these safety posters are one more link in this chain of training in safe working practices.

Standard Practices Include Safety Precautions

The printed instructions covering standard practices, which are available for reference on the job, include safety precautions as a part of the instructions, not as something separate. The installer referred to previously, if he is working in a territory where telephone wires or cables are carried on poles, would have access to a practice covering the running of "drops" from the pole to the house. This practice contains such statements as

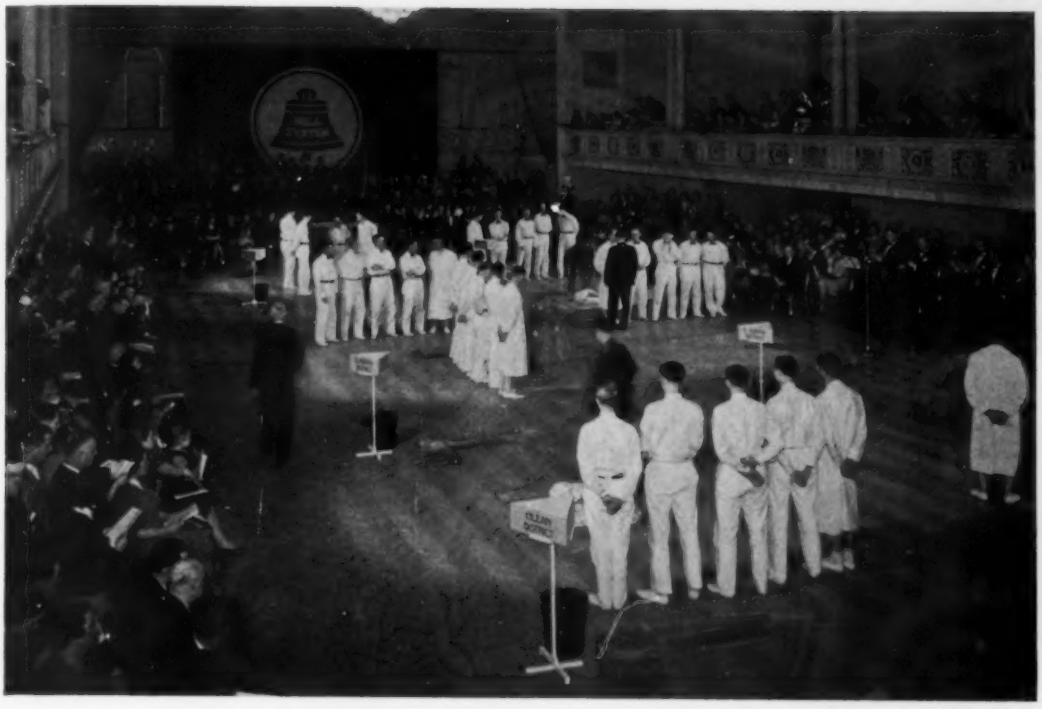
> ". . . lash ladder to the strand if it is not equipped with strand hooks."
>
> "When no traffic is approaching, carry the coil of wire across the highway, paying the wire out along the ground."

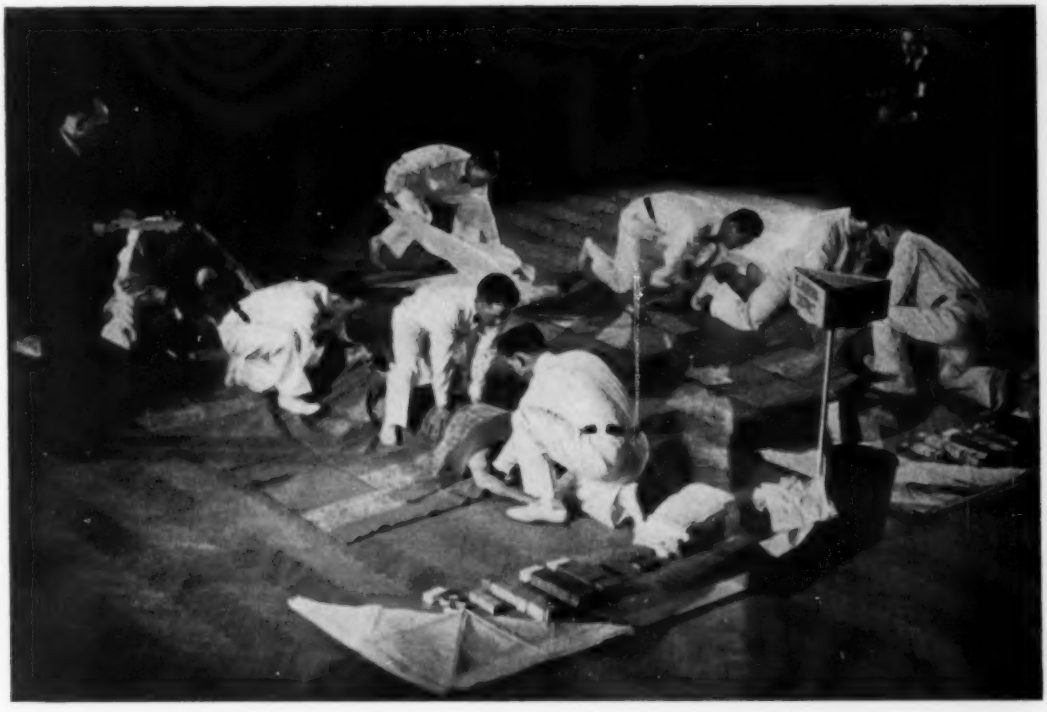
> "When traffic, tree or other conditions are such that one workman cannot string the drop wire over the highway with safety, assistance should be obtained before proceeding with the work."

Practices have been carefully checked and, where necessary, new ones substituted to insure that the method of doing a particular operation is a safe one. For example, a number of years ago, accidents were reported in connection with the unloading of poles from flat cars. A new method of unloading poles was therefore developed, the necessary additional equipment was designed, and a practice covering this method was prepared. Employees having occasion to do this work were then trained in the new method.

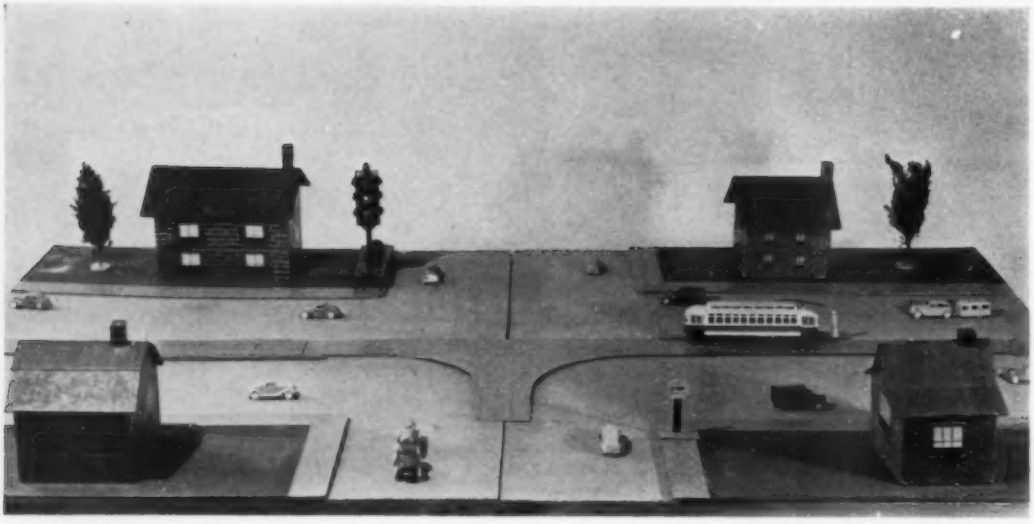
Or, as another example of developing safe working practices, consider the new practice in stringing drop wires or "loops" across a street. It had at one time been the practice for the installer to pay out the drop wire from the subscriber's house, across the street on the pavement, then climb the pole on the opposite side with a rope attached to the wire and, when traffic conditions permitted, raise the wire to the desired height. In spite of caution on the part of the employee, there was some danger that a vehicle might catch the wire and pull the employee from the pole. So, based upon experience in one of the Companies, a new method was developed. Now the employee first places a hand line over the crossarm or cable strand, and, standing on the ground at the foot of the pole, uses the line to raise the wire. This minimizes the possibility of injury to him if a passing vehicle should catch the wire.

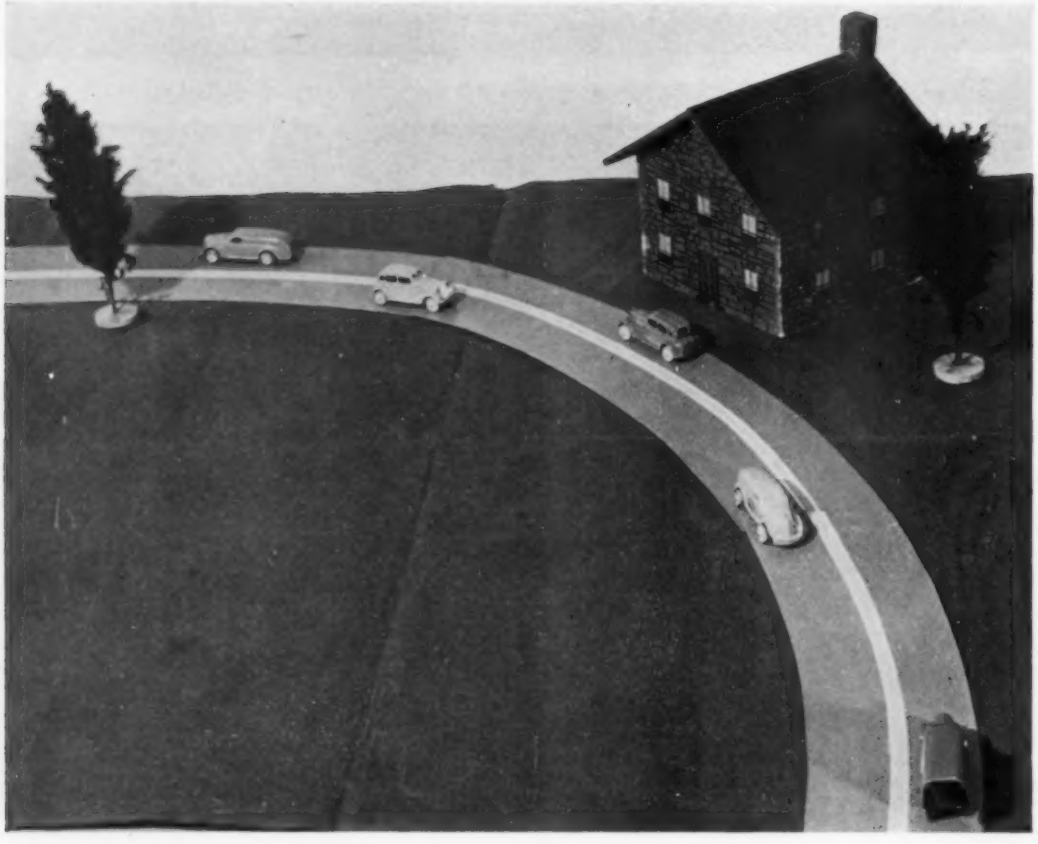
Some idea of the degree to which safety precautions are a part of the standard practices can be gained by reviewing the "Contents" on the first page of the standard 32-page practice, one of the illustrations for this article, which concerns "TOOLS —Use, Care and Maintenance of Extension Ladders."



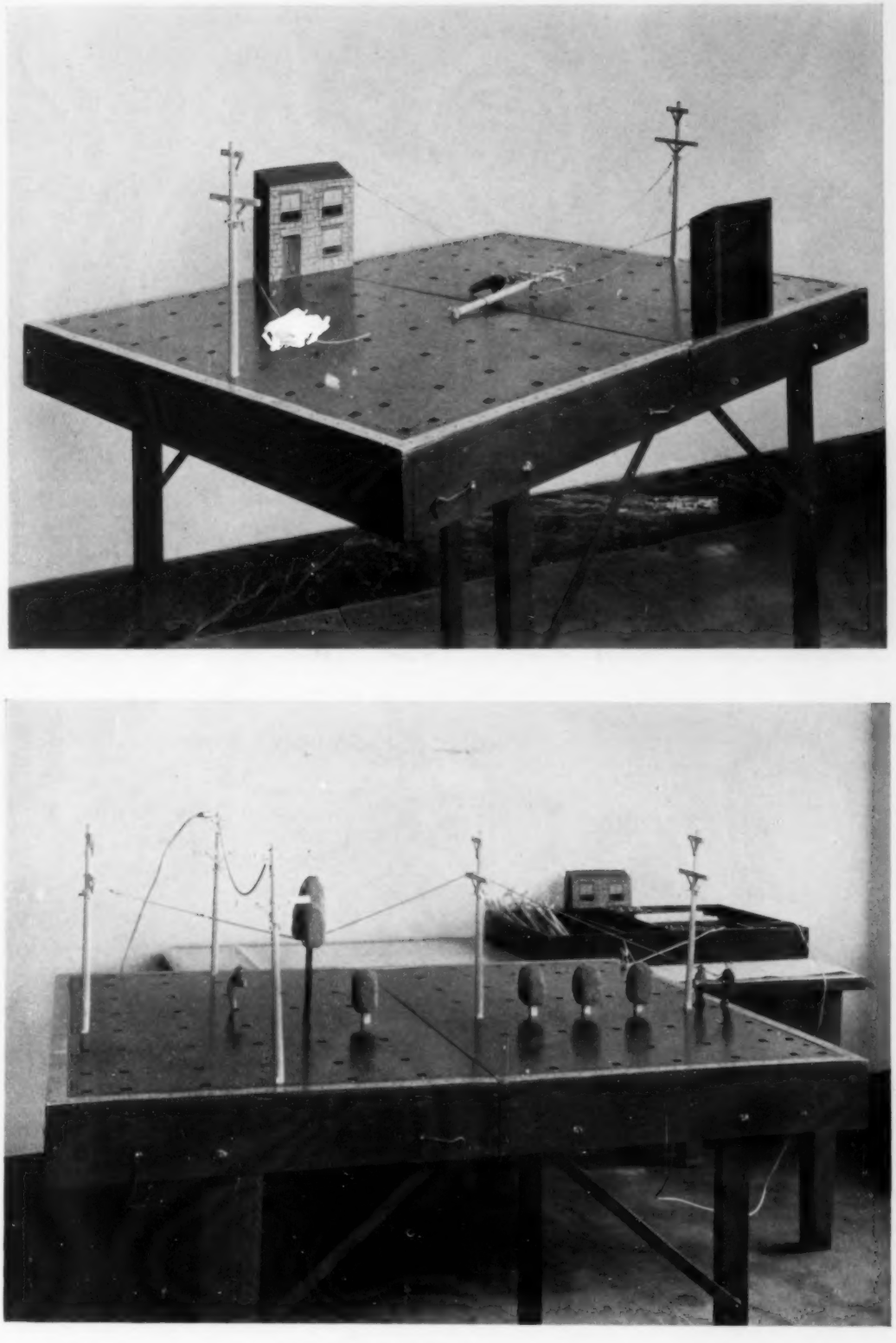


Scenes in a First Aid Contest of Teams of Bell System Telephone Men. Upper: Line-up Before the Announcement of a First Aid Problem. Lower: Two of the Teams Working on a Problem. See Page 262

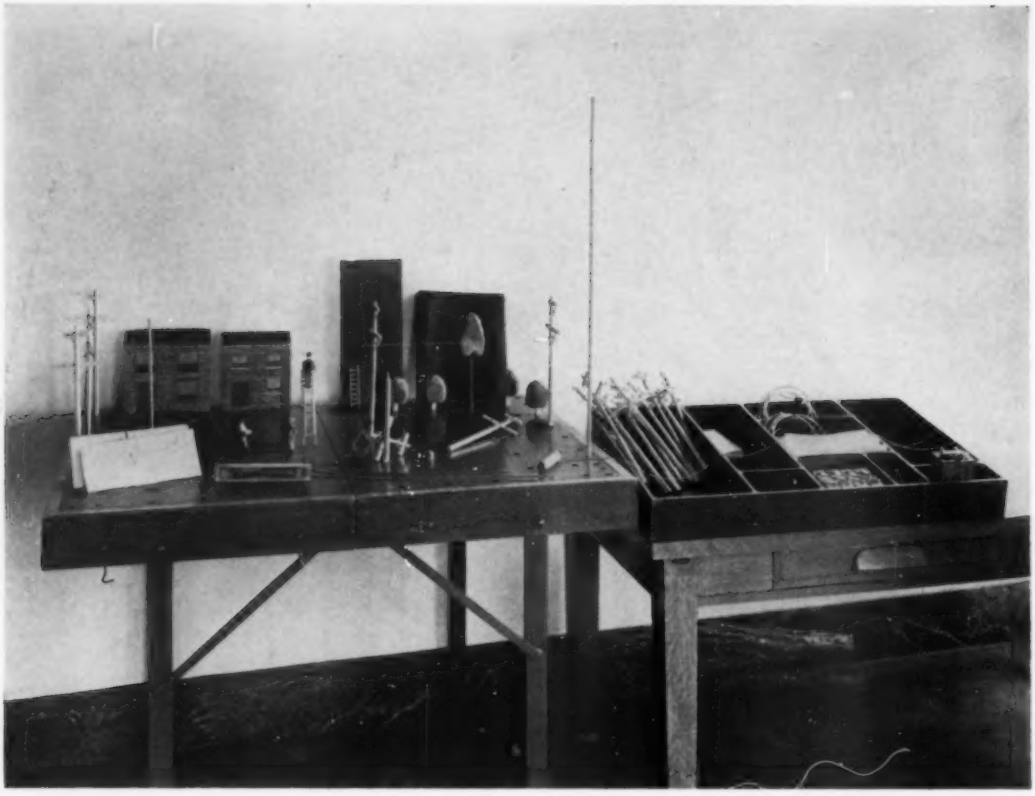




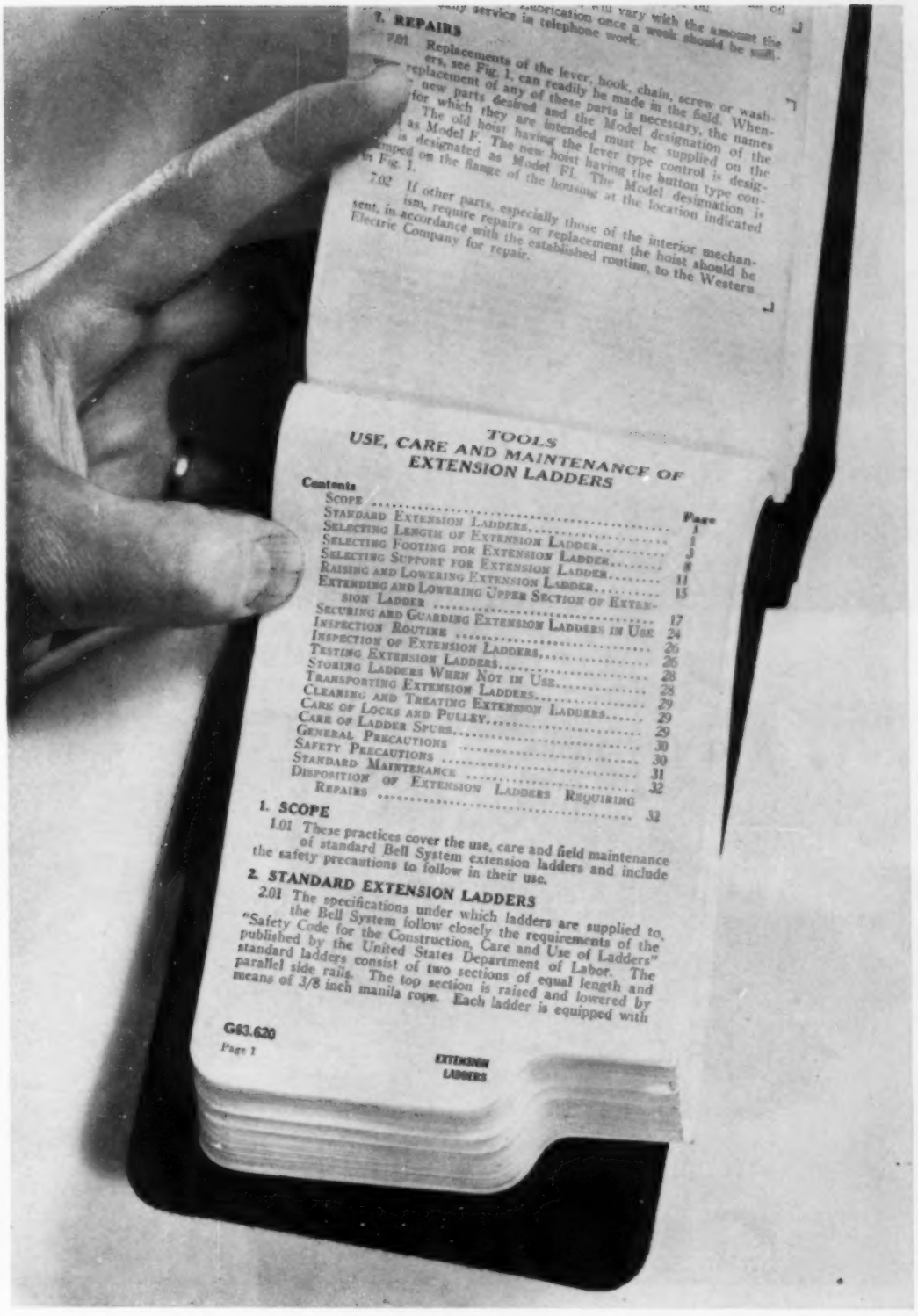
MODEL EQUIPMENT USED TO DEMONSTRATE SAFE AND COURTEOUS MOTOR VEHICLE OPERATION.
SEE PAGE 264



Pole, Ladder, and Electrical Safety Demonstration Board Referred to on Page 265



THE DEMONSTRATION BOARD AND EQUIPMENT FOR INSTRUCTION IN POLE, LADDER, AND ELECTRICAL SAFETY CAN BE EASILY TRANSPORTED IN THE CARRYING CASE SHOWN ABOVE



7. REPAIRS

7.01 Replacements of the lever, hook, chain, screw or washers, see Fig. 1, can readily be made in the field. When replacement of any of these parts is necessary, the names of new parts desired and the Model designation of the ... for which they are intended must be supplied on the ... The old hoist having the lever type control is designated as Model F. The new hoist having the button type control is designated as Model F1. The Model designation is stamped on the flange of the housing at the location indicated in Fig. 1.

7.02 If other parts, especially those of the interior mechanism, require repairs or replacement the hoist should be sent, in accordance with the established routine, to the Western Electric Company for repair.

TOOLS

USE, CARE AND MAINTENANCE OF EXTENSION LADDERS

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1. SCOPE

1.01 These practices cover the use, care and field maintenance of standard Bell System extension ladders and include the safety precautions to follow in their use.

2. STANDARD EXTENSION LADDERS

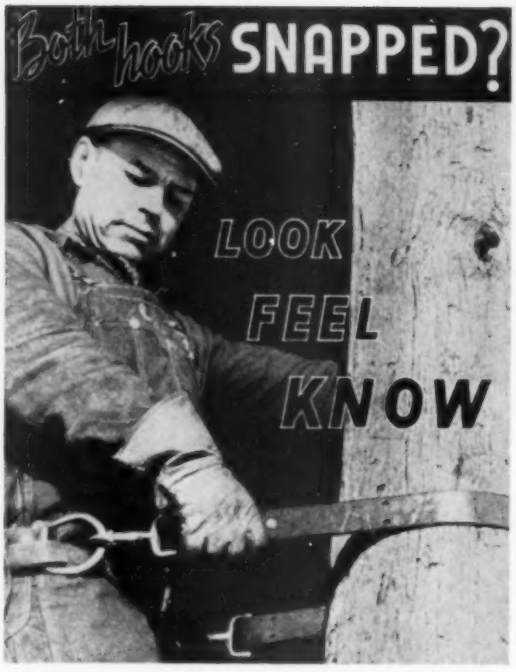
2.01 The specifications under which ladders are supplied to the Bell System follow closely the requirements of the "Safety Code for the Construction, Care and Use of Ladders" published by the United States Department of Labor. The standard ladders consist of two sections of equal length and parallel side rails. The top section is raised and lowered by means of 3/8 inch manila rope. Each ladder is equipped with

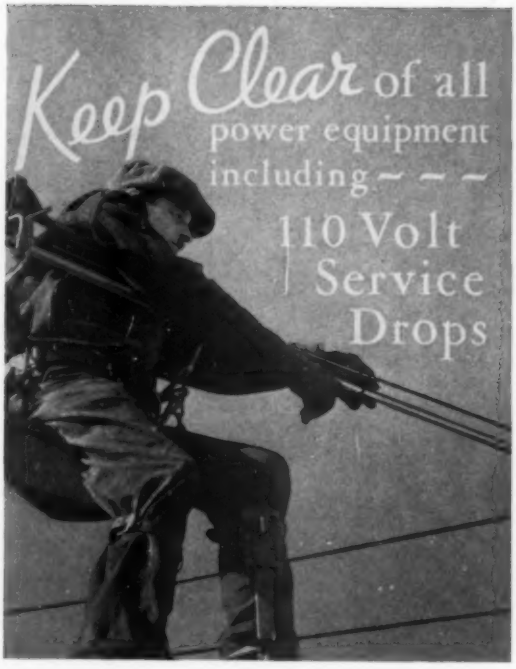
G83.620

Page 1

EXTENSION LADDERS

Safety Precautions Are a Part of the Standard Instructions as Indicated in the "Contents" of the Bell System Practice on "Use, Care and Maintenance of Extension Ladders"





Types of Safety Posters of Which About 11,000 Copies, Printed in Color, Are Used Each Month by Bell System Companies for the Instruction of Their Employees

Safe Plant, Tools, and Equipment

Not only is the telephone employee trained in safe working practices, but he is provided with tools and equipment designed with safety as one of the principal considerations. Although the nature of the telephone business makes it necessary for an employee to work on customers' premises, at the side of roads, and under other conditions over which the telephone company has no control, everything possible is done to make the telephone plant itself, on which the employee works, physically safe. There are definite standards for every article comprising this plant, and constant checks are made to see that these standards are maintained.

Probably everyone is familiar with the climbers or "spurs" used by telephone men in climbing and working on unstepped poles. In the early days of the telephone it was the practice for the employees to supply their own tools, including their climbers. For this reason, various types of climbers were used, some good and some not so good. Later on the telephone companies took over the supplying of these tools, buying commercial climbers for this purpose. It was found, however, that occasionally the gaff on one of these climbers was defective, endangering the lineman on the pole. It was then decided to prepare specifications for Bell System climbers and to have them manufactured under these specifications. Special heat treatment of the entire climber was resorted to, to insure a uniform structure in the steel throughout, and a routine was set up calling for rigid tests and inspections of samples from each manufactured lot. The result was a climber which has proved satisfactory from both an efficiency and a safety standpoint.

Then there are the body belts and safety straps which telephone employees use to support themselves while working on poles, and which at one time they also provided for themselves. Occasionally one of these failed in service. As a first step in

insuring the use of safe belts and straps, the telephone companies adopted the policy of supplying these tools rather than requiring the employees to furnish their own. A thorough study of belts and straps was next undertaken, and specifications for Bell System standard articles drawn up. Best quality back leather is specified for the straps, all hardware is drop forged, all rivets in the body belt are electrically insulated, and specially designed snap hooks are used. Samples of each manufactured lot of belt rings and snap hooks are tested to destruction, and each completed strap is given a thorough visual inspection to determine that the high quality of workmanship which has been prescribed is really being followed.

Both of the items described above are used by employees working on poles. But safe equipment for employees working elsewhere has not been neglected. For example, gas detectors have been developed for employees who have occasion to enter manholes, special ladders have been developed for central office employees, and countless other articles have been either designed or improved to insure the incorporation of safety features.

Supervision

Not only are employees trained to work safely and provided with correctly designed tools and equipment; it is equally essential that their supervisors also shall be "safety conscious." While the success of any safety program is usually but a reflection of the interest manifested by all levels of management in the prevention of accidents, it is, after all, the first-line supervisor or foreman with whom the craft workman comes in daily contact. It is the foreman who is actively engaged in directing the operations on the job and it is, therefore, necessary that he be properly trained to fulfill his obligations to see that his men do their work the safe way.

While it is obviously impossible in any training course to cover every condition which the foreman may meet in the field,

it is possible by developmental training to cultivate judgment on his part. He should be able to recognize unusual conditions and to plan his work and assign his men so that the work is done safely and efficiently. The technical knowledge which he needs in the operation of his job is always available, but unless he has developed the proper type of judgment, he and his crew will not be able to work safely. For example, suppose that some telephone wires are to be removed from a pole line over one span of which electric light and power circuits cross above the telephone wires. A foreman who is safety conscious will realize that extra precautions must be taken to prevent the telephone wires from flipping up into contact with the power circuits during the dismantling job. He will, therefore, plan this job and supervise it, as provided for in the standard practices, to eliminate any possibility of contact with the power circuits. As another example, suppose it is necessary for a man to ride the suspension strand of a river crossing span. The line may be 50 feet or so above the level of the water and several hundred feet long. For this particular job the foreman will be sure to assign a man who is experienced in that type of work and can therefore be depended upon to take every necessary precaution as he crosses above the river.

In addition to planning the job so as to meet safely any possible conditions, the foreman keeps a constant check on the actions of the men working under his supervision. Even though his craftsmen have been trained in the correct working practices, there is a possibility that from time to time they may develop unsafe habits. The foreman must be on the alert to check the development of hazardous practices before they become established habits.

A good foreman also recognizes that in certain individual situations the usual alertness may be lacking. He realizes, for instance, that when a man returns from vacation or from sickness he may require more direct supervision than at other times. He knows, too, that if his men have personal worries they may

not work as safely as they normally do, and so he makes it a point to acquaint himself with the members of his crew and to direct their activities at such times with particular care.

Accident Data and Their Use

In order to administer as large an industry as the telephone business, full of technicalities and details, results must be tabulated accurately, and as frequently as the particular activity warrants. A knowledge of these results, and of the underlying conditions, is used to measure the trends of the business. And so, in order to determine the effectiveness of these safety activities, it is necessary, of course, to have a score card or balance sheet. The accident data are used for this purpose. From a review of the cases which have occurred in the past, it is possible to judge where attention might most profitably be applied. This information is issued periodically for supervisory use.

Also, a summary of the descriptions of cases which have occurred is discussed with employees doing similar work. These discussions cover in detail the way the job was being done, what standard practices were concerned, and how similar occurrences may be prevented in the future. The discussions of these personal injury cases have been found to be very effective in encouraging the men to check their own work habits and also to discuss freely the safety features of any job. Over 5,000 copies of these descriptions are distributed monthly throughout the Bell System. The use of this information, furnished by all the companies, again illustrates the coöperative endeavor throughout the System to eliminate risk by making safety a primary factor in every phase of every job.

From border to border and from sea to sea stretch the telephone lines of the Bell System, linking cities and towns and entering distant farmhouses, urban homes, apartments, stores, offices, factories—every type of dwelling and business structure. Over this nation-wide web of communication facilities the Sys-

tem's 82,000 plant men stand guard, maintaining it always, altering and extending it as the need requires. That the prevention of accidents has for years permeated this far-flung organization as a day in and day out policy is due to the active encouragement of those who have been in a position to visualize broadly the other side of the picture: the tragedy of the injured victim, and the economic loss to industry, when an accident does occur. It is obvious, however, that this policy could not be translated into a definite part of every practice and of every job without the whole-hearted coöperation of all the men and women who fulfil the System's responsibility of providing telephone service for the nation. They, too, know that, in their daily lives, safety—not only on the job but in the home, in the schools, on the streets and highways—makes sense, and that by doing things the safe way all are the gainers: not only themselves as individuals, but telephone users, the owners of the business, and the public at large.

ERLE S. MINER

Notes on Recent Occurrences

RESUME RADIO–TELEPHONE SERVICE TO EUROPE OVER NEW CIRCUITS

RADIO–TELEPHONE service across the Atlantic, interrupted for a short period by the outbreak of war in Europe, has been resumed with Belgium, Bulgaria, Denmark, Finland, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Roumania, Slovakia, Sweden, Switzerland and Yugo-Slavia. The service includes (as of October 1) all European countries formerly reached with the exception of Poland, Portugal and Spain.

Transatlantic telephone service with the Continent was reopened through new radio telephone circuits connecting New York with Rome and Amsterdam. While the Rome circuit had already been scheduled for operation later in September, its opening was hastened to meet the emergency. To provide additional urgently needed facilities to the continent, arrangements were also made on short notice to bring a channel to Amsterdam into service.

At the present writing, England is accepting only calls involving the Government or the Bank of England, while France generally accepts none but calls from the Government, banking, and the press.

PIONEERS HEAR MR. GIFFORD DURING GENERAL ASSEMBLY

NEARLY 275 delegates to and guests at the eighteenth annual General Assembly of the Telephone Pioneers of America, and members of the five New York City chapters, met at dinner in four New York hotels on September 22, and

heard over a telephone hook-up an address by President Walter S. Gifford of the American Telephone and Telegraph Company, who is serving during the current year as President of the Pioneers. Mr. Gifford's remarks are given in full beginning on page 221 of this issue. At the business meeting of the organization, earlier that day, John J. Robinson, President of the New England Telephone and Telegraph Company, was elected President of the Pioneers for the coming year, and John H. Brace, Vice President of the Bell Telephone Company of Canada, was elected Senior Vice President.

OBSERVE 25TH ANNIVERSARY OF FIRST CONVERSATION OVER TRANSCONTINENTAL TELEPHONE LINE

NEARLY 200 men who had played a part more than a quartery-century ago in the planning, designing, or building of the first transcontinental telephone line met in seven cities from coast to coast on Friday, July 28, to observe the 25th anniversary of the first telephone conversation between New York and San Francisco. That historic call took place on July 29, 1914, when Theodore N. Vail, then President of the American Telephone and Telegraph Company, talked with G. E. McFarland, then President of the Pacific Telephone and Telegraph Company.

The seven cities linked by telephone last July for the anniversary observance, and the number of men present in each who had had some direct connection with the first transcontinental line, were: New York, 77; Philadelphia, 9; Cleveland, 20; Chicago, 14; Omaha, 13; Denver, 18; and San Francisco, 43. In addition, telephone officials and guests increased the attendance at several of the cities.

It was six P.M. in New York City when T. G. Miller, Vice President of the A. T. & T. Co. in charge of the Long Lines Department, opened the program by calling the roll of the

other cities along the line. In San Francisco it was a few moments after two o'clock when Mr. Miller, speaking with President N. R. Powley of the Pacific Telephone and Telegraph Company, recalled the momentous occasion of 25 years before.

Following the calling of the roll of cities, Mr. Miller introduced Dr. Frank B. Jewett, Vice President of the A. T. & T. Co. and President of the Bell Telephone Laboratories. Dr. Jewett's remarks on this occasion are given in full beginning on page 228 of this issue.

After Dr. Jewett's talk, a telegram was read from President Walter S. Gifford of the A. T. & T. Co., who was unable to be present. The Voders which are part of the Bell System exhibits at the World's Fairs in New York and San Francisco were then connected to their respective ends of the line, and exchanged greetings and some casual conversation.

The final feature of the program was the semi-serious formation and momentary existence of the "Society of Planners and Builders of the First Transcontinental Telephone Line." By a series of motions, this society was created, provided with officers, and adjourned *sine die*—in all probability never to meet again, even by telephone. It existed just long enough to provide those present in the seven cities with handsome certificates of membership as souvenirs of the occasion.

At the conclusion of the formal program, the telephone line was made available to all present, so that old friends might exchange greetings and chat back and forth from city to city.

Although the first trial conversation between New York and San Francisco took place on July 29, 1914, the transcontinental line was not made available for public use until January of 1915. In that year it carried an average of three calls per day. Today there are four transcontinental telephone lines, each having a number of circuits, and they handle an average of 1,700 calls a day between the Pacific coast and points east of Denver.